

Royal Commission

on Canada's Economic Prospects

The Outlook for
the Canadian Forest
Industries

by John Davis, A. L. Best, P. E. Lachance, S. L. Pringle,
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**THE OUTLOOK
FOR
THE CANADIAN FOREST INDUSTRIES**

By THE FORESTRY STUDY GROUP

MARCH, 1957

*While authorizing the publication of
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We are particularly indebted to the Canadian International Paper Company and to the Canadian Pulp and Paper Association for making available the services of Dr. D. A. Wilson and Mr. J. M. Smith. We also wish to acknowledge our debt to that association for its contribution to the section of the study which deals with the market for pulp and paper, and to Mr. W. A. E. Peplar, manager of the Woodlands Section for advice contributed on matters relating to forestry.

Information of a general economic nature pertaining to resources was not readily available. With this need in mind Dr. P. E. Lachance and Mr. A. L. Best arranged to visit the various provincial authorities. A great deal of statistical and qualitative information concerning regional supply trends was obtained in this way. The generous reception and co-operation which was subsequently obtained from forestry officials in the various provincial government departments has been much appreciated.

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CANADIAN FOREST INDUSTRY PROSPECTS TO 1980
 Value of Production in Millions of Constant 1955 dollars.*

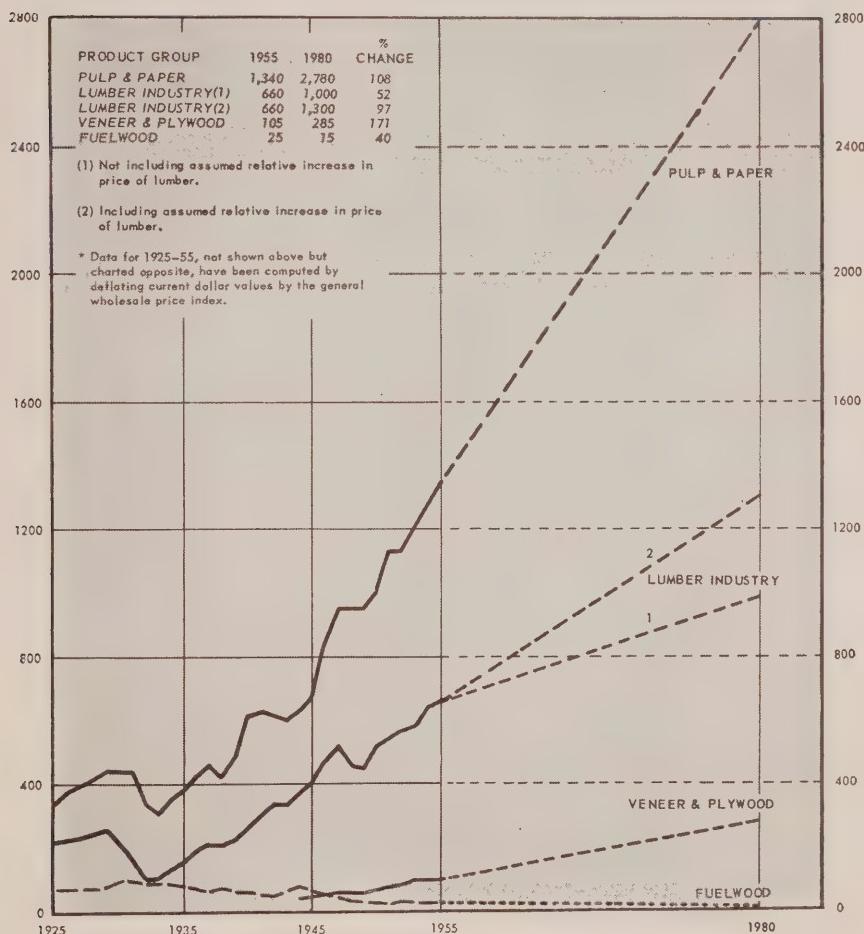


Figure 1

SUMMARY

FOR MORE than a century Canada's forest industries have constituted a major sector of the national economy. That they will continue to play a leading role over the next 20 to 30 years, there can be little doubt. The demand for wood products is rising both at home and abroad. In many countries current levels of utilization are already pressing against available wood supplies. But in Canada the physical resources necessary to support a substantial increase in production appear to be available. Thus, although cost and price considerations may limit expansion in some parts of Canada and result in marketing problems with respect to certain forest products, the outlook is for a marked increase in both domestic sales and exports during the next quarter century.

It is interesting to note that the total amount of wood utilized in North America is about the same today as it was in 1900. Consumption in Canada and the United States, taken together, was about the same in 1950 as it was in 1920. There have, of course, been major variations in the uses served by wood in its various forms. Over the years, numerous forest products have gained while others have lost ground. For example, a marked decline in fuel-wood has tended to offset the growing requirements of the pulp and paper mills. Sawn lumber production has shown only a modest rise. Also the demand for such primary products as fence posts, pitprops and piling has actually declined, its place being taken in recent years by a rapid expansion in the market for such manufactured commodities as fibreboard, hardboard, plywood and veneer.

From now on, the demand for wood in the aggregate is likely to move persistently upward. Already the more dynamic "growth" categories of use, having become larger in relation to the total, are tending to drive over-all requirements still higher. Not only is wood still employed extensively in construction but it is becoming, more and more, a raw material for other industries. This persistent trend is likely to ensure that, from now on, total wood requirements are likely to rise more in line with economic activity in general.

Resources sufficient to meet these demands appear to be available. Improved forest management and technological improvements which will permit the use of a wider range of tree species and more wood from each tree will add appreciably to North America's available supply. This, like the opening up of new and more remote forested areas in northern and western Canada, may involve a further increase in real costs. Indeed, it is the resulting impact

on prices, rather than the adequacy of supply in the physical sense, that is likely to determine both the size and the share of the market which Canadian producers of forest products will obtain between now and 1980.

Canada's lumber production, it is expected, will show a volume increase of approximately 55% during the 25-year period under study. This estimate takes into account the rising costs associated with expanding production and, on the other hand, the competitive strength of such alternative materials as steel, aluminum, cement and the plastics. In effect, supply and demand can be brought to a balance at the projective production level with a 30% increase in real price. It is possible that at this higher relative price more material of sawlog size which otherwise would have been used for the manufacture of pulp and paper may be used in the production of planks and boards. Sawmill operations will also be extended into some of the more remote and higher-cost areas of Canada.

Most of this increase in lumber output will originate in British Columbia. About half of the total will be sold for domestic consumption. Meanwhile, a somewhat larger proportion of all Canadian lumber exports will be sold in the United States.

Canadian production of softwood plywood, hardboard, insulation board and other sheet materials is expected to rise much more rapidly. Over the next quarter century and depending upon the product in question, output may reach two or three times its present level. With the exception of peeler logs for the production of hardwood plywood and veneer, no serious supply problems are likely to be encountered. Instead, the main determinant, in most cases, will be the size of the market. Exports to the United States and other countries will continue to be limited both by strong competition and by high tariffs. Imports, particularly of hardwood products from the Far East, may also affect the volume of Canadian production sold for construction and industrial purposes in this country.

Pulp and paper production in Canada may more than double over the next quarter century. The product structure of the industry is expected to change little: newsprint and market wood pulp, both of which flow to world markets virtually unimpeded by tariffs and which together accounted for some 83% of the 1954 industry output, are expected by 1980 to make up 81% of output. The many other grades of paper and paperboard should continue to experience relatively more rapid expansion. Production of these grades has been primarily geared to the domestic market, and it is assumed that this situation will show no material change. But the anticipated high rate of Canadian economic development seems destined to ensure rapid growth in these sectors.

The expansion of market pulp exports is expected to be accompanied by very little change in distribution. The United States may continue to take

about three-quarters of the expanding total, with the United Kingdom accounting for most of the remainder. In newsprint, a changing pattern is expected. In relation to the prewar market, the postwar United States market has taken a greatly increased proportion of Canadian newsprint exports, reaching a peak of almost 96% in 1950 as against 76% in 1935-39. Since 1950, the proportion has declined. This has occurred as a result of two factors: a general improvement in the trading positions of overseas countries resulting in a strengthening of their ability to purchase and, secondly, a rapidly rising basic demand trend abroad. These two factors brought about roughly a 250% increase in the overseas exports between 1950 and 1955. In essence, it is assumed that these two factors will continue to operate. The result for 1980 may be summarized as follows: shipments to the United States may rise by about 50% while exports overseas may increase by as much as 400%. Shipments to Canadian consumers, it should be added, should about double over this period.

In connection with pulpwood exports, though the volume has shown a long-run tendency to increase, sales to the United States may level off or even decline during the forecast period. Several influences are working in this direction. The increased wood requirements of Canadian mills will result in a greater home demand for wood formerly sold elsewhere in unmanufactured form. Also, nearby mills in the United States, because they will be able to rely more extensively on domestic hardwoods, will be able to obtain more of their wood from local sources.

Consumption of fuelwood in Canada is dropping. For example, production from farm woodlots between 1940 and 1950 declined by approximately one-half. Studies pertaining to the supply of and demand for energy prepared by this Commission have indicated that wood, either in the round or as mill waste, will become an even less important source of fuel supply in the future. Estimates contained in this report indicate that the total demand for fuelwood may fall from 4 million cords in 1954 to about 2 million cords in 1980. Table 1, outlines the market predictions for these various Canadian-produced forest products.

In order to compute the merchantable quantity of standing timber needed to meet these requirements, it is necessary to convert to a roundwood basis. Such a conversion necessarily takes into account future changes in utilization practice. For example, more extensive utilization of mill waste and the adoption of higher yield methods of pulping will reduce the amount of roundwood required per unit of end product. A reduction of losses in the harvesting phase will also serve to reduce the drain on the supply of commercial timber.

At the present time the total roundwood production in Canada is in the order of 3.1 billion cubic feet. Were there to be no change in utilization efficiency, the foregoing demands would require more than 5 billion cubic feet

of wood to be logged in 1980. As a result of these various wood economies, however, the total requirement in terms of merchantable timber may increase by less than 60% to approximately 4.9 billion cubic feet a quarter of a century from now.

Table 1

**CANADIAN-PRODUCED FOREST PRODUCTS,
ESTIMATED DEMAND, 1980 vs. UTILIZATION, 1954**

(millions of cubic feet)

	1954	1980	Percentage change
Wood for domestic pulp and paper industry.....	1,100	2,120	+ 93
Logs for lumber and other sawn products.....	1,400	2,220	+ 59
Logs for softwood plywood and veneer.....	40	130	+225
Logs for hardwood plywood and veneer.....	20	30	+ 50
Pulpwood exports.....	160	150	— 6
Fuelwood.....	310	160	— 48
Miscellaneous roundwood			
Domestic.....	50	55	+ 10
Export.....	25	25	Nil
Total.....	3,105	4,890	+ 57

Further complications arise with regard to tree species, log size and market requirements. For instance, the existence of substantially unused stands of hardwoods in Canada will act as a spur to their greater use for industrial purposes. More will certainly be used for the production of newsprint and other pulp and paper products. On the other hand, there will be a decline in the use of hardwood as fuel. On balance, it is assumed that the relationship between the total volume of hardwoods and softwoods will remain essentially unchanged through to 1980. Thus, the volume of hardwood cut in Canada in 1980 is expected to be about 12% of the total annual cut.

The availability of certain species will also exert a significant influence on production and consumption trends. In the past, the forest industries in Canada have had to be selective as to their choice of wood. In many areas they concentrated on the use of a few tree species, such as white pine, Douglas fir and white spruce, which could be processed at minimum cost and sold on grounds of quality to markets around the world. More recently, shortages of low-cost wood (more frequently elsewhere than in Canada) have led to technological developments that have permitted a greater proportionate use of hardwoods and other softwoods which, in earlier days, were bypassed. Cost reductions, made possible by more advanced production techniques and aided by the growing acceptability of commodities manufactured from these other species, will continue to add to the volume and variety of the output of Canada's forest industries.

In an attempt to assess the available wood supply in Canada, "allowable cut" estimates were obtained from government sources. This information,

adjusted so as to take into account the additional volume of wood resulting from expected improvements in forest management, indicated a potential available supply of 9.5 billion cubic feet in 1980. Of this some 7.3 billion cubic feet may exist on what are classified as accessible forest lands. Another 2.2 billion cubic feet, considered to be available in potentially accessible areas, represents an additional reserve for the future.

As previously stated, the commercial requirements in 1980 may be in the vicinity of 4.9 billion cubic feet. To this must be added expected annual epidemic losses from fire, insects and disease. The total drain is forecast as being in the order of 5.4 billion cubic feet 25 years from now. Were this to be the case, total depletion in Canada in 1980 would represent 74% of the productive capacity of the forests now considered as accessible, and only 57% of the total forest potential. Table 2 compares the estimated depletion in 1980 with the adjusted allowable cut for different regions 25 years hence.

The direction of future regional expansion trends will be affected by both market and supply considerations. Estimates as to the quantity of each major product—sawlogs, peeler logs or pulpwood—which will constitute production in each region in 1980 are little more than informed guesses. The level actually achieved will depend not only upon the volume and quality of the available resources but also upon the policies pursued by the government authorities concerned. It is reasonable to expect, however, that a long-term westward shift in forest industry activity is in prospect. The Prairies and North region, because it contains extensive reserves of new timber, appears to be capable of achieving the greatest rate of development. British Columbia, for reasons of both volume and quality, may supply most of the increased demand for lumber. A relative increase in population in the western half of North America, by influencing market growth, will also be a contributing factor.

Table 2
ALLOWABLE CUT vs. ESTIMATED DEPLETION, 1980
(millions of cubic feet)

Region	Adjusted allowable cut	Depletion 1980			Percentage of adjusted allowable cut
		Roundwood requirements	Losses	Total	
Atlantic.....	1,050	500	47	547	52
Central.....	4,020	2,250	217	2,467	61
Prairies and North.....	2,440	500	159	659	27
British Columbia.....	2,000	1,650	74	1,724	86
Canada.....	9,510	4,900	497	5,397	57

In rounding out this study, attention was also paid to the long-run trends in real prices. In contrast to many other raw materials the real cost of wood has been rising. Salaries and wages have become a more important item of expenditure in logging. Not only have they risen in relation to those paid

in other industries, but output per man-hour has fallen steadily behind that in most other sectors of the economy. Only in the last few years has there been any definite indication of a long-run improvement in the over-all productivity of woods labour.

Offsetting this to a considerable degree has been the steady increase in efficiency in processing plant and equipment. Productivity gains in the pulp and paper mills have been such as to counteract the rise in real cost of pulp-wood. Meanwhile, because of the lesser value added in manufacture, there has been less scope for production economies in sawmilling. Over the long run the real cost of production and the real price of lumber have therefore continued to rise in relation to those of most other commodities.

Over the next 25 years considerable amounts of money will be invested in the forest industries. It is estimated that an average annual outlay of from \$300 million to \$400 million will have to be maintained if these forecasts are to be realized. This compares with an average of \$165 million invested by all the forest industries in recent years. Much of the future capital expenditure will result in improved efficiency at all levels. However, the extent to which Canada's forest industries are able to engage in the further processing of wood will determine, in large measure, their success in marketing their products in competition with the mineral-based materials, the real price of which is generally tending to move downward.

If the accompanying forecasts are realized, the Canadian forest industries, as a group, will more than double in size. Their output, measured in constant dollar terms, may reach \$4 billion by 1980, approximately 120% above the 1955 level. This, however, is a lesser rate than that envisaged (in the Commission's other staff studies) for the Canadian economy as a whole. As the latter may rise by approximately 200%, the forest industries' contribution (as measured in terms of Gross Domestic Product) may fall from around 5½% to approximately 4% between now and 1980. Employment, after allowing for a substantial increase in labour productivity, may rise by about one-third to some 375,000 workers, but even this would represent a decline from 5.3% to about 3.8% of the total number of Canadian workers 25 years from now. Exports of forest products will approximately double, reaching a value of perhaps \$2.9 billion in 1980. But again, because of the remarkable increase in Canadian sales abroad of fuels, metals and other mineral products, the value of lumber, pulp and paper and other forest products sold outside of Canada is expected to decline from approximately 35% to around 25% of the total value of Canadian commodity exports in the period from 1955 to 1980.

INTRODUCTION

THROUGHOUT HISTORY, wood has been one of the most useful materials available to the hand of man. Possessing the twin properties of strength and workability, it has long been an ideal material for construction. But its role has by no means been confined to the building trades. It supplies nearly half of the world's space-heating requirements and, within the past half century, not only has it become the world's major source of such fibrous commodities as papers and packaging materials but, through chemical processing, it is being converted into an ever growing volume of such products as rayon, cellophane, food extracts and industrial chemicals.

Possessing forest resources of an extent and character suitable to mass exploitation, Canada is in the enviable position of being a "have" nation insofar as wood wealth is concerned. Favourable soil and climatic conditions have helped. So have ready access to markets, a continuing growth in world demand, and the progressive depletion of virgin resources elsewhere.

These, together with a history of technological advancement comparable to the best anywhere, are among the main reasons why Canadians have developed their forest industries as a source of income and employment. Aided by the latest mechanical devices and possessing some of the largest and most up-to-date mills anywhere, they have become, through the medium of international trade in lumber, newsprint paper and pulps, a people whose material well-being is, and will continue to be, geared closely to the fortunes of their forest products industries.

Even in Canada, few realize the country's dependence upon its forest resources. Great construction projects, especially in connection with power, metal mining, oil and, recently, natural gas, have received great publicity. Yet they are small by comparison. Today, one of every 12 Canadians working in the nation's goods-producing industries is concerned with forestry or the manufacture of forest products. More than one-third¹ of Canada's total ex-

¹35% in 1954 and 1955.

port earnings comes from the sale elsewhere of logs, paper, wood pulp, and lumber and its related products. Of all the manufacturing industries in Canada, that of pulp and paper stands first in terms of wages paid, first in new investment and first in net value of output. Its production in dollar terms is greater than that of the nation's wheat crop; more than twice that of all the nation's metal mines. In 1954, Canada's sawmills, with the second largest industrial wage bill, ran third in export earnings and fourth in net value of production.

Viewed in its international setting, this sector's performance is no less impressive. Well over 10% of all the wood logged for industrial purposes originates in Canada. Indeed, Canada in this respect stands third only to the United States and Soviet Russia.² Between 35% and 40% of the world's international trade in forest products involves this country. This, too, places Canada slightly ahead of the northern European countries (Norway, Sweden and Finland) as an exporter of wood and its manufactures. First in newsprint, first in lumber, and following closely behind Sweden as an exporter of pulps, this country is steadily gaining, in relation to others, in the business it is doing in wood products.

It is only natural that this should be so. In a country of continental extent, where much of the land surface is unsuited to agriculture and where great stands of timber still lie comparatively untouched, the forest industries are bound to continue to be of importance.³ If Canada's fortunate position is contrasted with that of many other parts of the world, in which the forests either have been seriously depleted or are already taxed beyond their capacity to meet the steady upward pressure of demand for industrial wood, the prospect of even greater activity in this country appears none too surprising. In all probability, the United States market for Canadian forest products will be greater than it has ever been in the past. Overseas, and especially in western Europe, the demand for lumber, pulp and paper, and other wood products will also be mounting. Whether currency and other arrangements can be made for a commensurate flow of exports from this country remains to be seen. However, taken in aggregate, it would appear that requirements at home, in the United States of America, and elsewhere will call for more than a doubling in the output of Canada's forest industries a quarter of a century from now.

To assume that the marketing of Canadian forest products will present no serious problem would be naïve. Higher transportation costs and a continuing shortage of dollars, arising in part from North America's reluctance to import non-dollar goods, will probably limit overseas sales. Protective tariff measures enforced abroad, particularly by the United States,

²The United States and Soviet Russia each produce about 30% of the world's industrial timber; the northern European (that is, Norway, Sweden and Finland) countries together produce about 8%.

³Almost 65% of Canada's provincial land area is occupied by forests.

will limit further processing. Unless there is a change in the present American tariffs on most papers, plywood, fibreboard, and the like, a good deal of otherwise usable wood will be left to rot in the forest, to run to waste at the mills or to be made into lower-grade products. Canada's forest industries, in other words, will be prevented from taking on structural characteristics more consistent with their physical advantages and a true international division of labour.

Then there is also the possibility that the manufacture of newsprint and other pulps from alternative materials will become an economic reality; that potential markets in a number of relatively underdeveloped countries will be shut off by the erection there of newsprint mills based on extensive local resources such as bagasse (sugar-cane waste) or tropical hardwoods; and that, as lumber grows scarcer and its price rises, tariff-protected substitutes, many based on wood formerly regarded as of inferior quality, will continue to take its place.

Finally, there is what is probably the greatest enigma of all, the possibility of greater competition from the Iron Curtain countries, particularly from Russia herself with her great forest resource wealth. Whether a persistent effort in this direction will be made is uncertain, but in any case occasional dislocations can be expected. These, along with offerings from other sources, changes in technology which work to the advantage of the hardwood-forested countries, and the idiosyncrasies of the world's industrial markets themselves, will doubtless call for added versatility on the part of Canadian producers.

Demand, though it may fluctuate, will continue to rise. Although the probable rate of growth does not appear to be such as to cause concern about the available wood supply for Canada as a whole, regional problems of supply are expected to occur within the next 25 years; and production in some regions will thus rise more than in others. For example, in long-established areas of the Maritime Provinces, southern Quebec and central Ontario, the combined drain from cutting, fire, insects and disease is already at a relatively high level. In such areas further increases in output will be especially dependent upon improved forest management practices. The centre of gravity of both the sawmilling and the pulp and paper industries will be shifting westward. Closer integration, caused by rising prices and made possible by advances in technology, will also result in a greater saving in operating costs. Canada can, therefore, expect to have a stronger, more efficient, and better rounded group of forest industries in 1980 than she has today. The success of these industries in attaining these objectives will, however, reflect the zeal and intelligence with which government, industry and the small private owner of forest lands apply the basic tenets of sound forestry principles.

Yet there are other matters besides markets and adequacy of resources to take into account. The reader, if he knows much about the evolution and

present structure of these industries, will also be interested in their future status and their interrelationships one with another and collectively with the rest of the economy. He will want to know what form they are going to take, what products they are likely to produce and in what part of the country to expect the greatest development. He will want to weigh the prospects of lumbering against those of the more highly manufactured composite boards, pulps, papers and by-product chemicals. Whether processing of Canadian forest resources will show an increase proportionate to manufacturing in general, and whether or not the use of a wider variety of species will allow already heavily cut-over areas to continue to support forest industries, will also be matters of concern. It is in an attempt to cast some further light on these questions and, at the same time, to assess the contribution which the forest product industries are likely to make to the Canadian economy in the future, that this study has been undertaken.

2

CANADA'S FOREST RESOURCES IN WORLD PERSPECTIVE

NEARLY 30% of the world's land surface is covered with forms of vegetation which are recognized as forests. The existence of these forests and the great regional differences in their component species are the products of a multitude of circumstances. Latitude, elevation, topography, and the resultant climate and soils, as they now exist and as they have varied over the eons of geological time, have been fundamental in determining the pattern of forest distribution. The forest has been shaped by other elements of its environment: by insects and disease organisms which have preyed on selected species; by wildfire which has favoured some trees at the expense of others; and by man, who by his use and misuse of the forest has altered its composition, sometimes improving it and sometimes replacing it with settlement, farmland or even desert waste. Figure 2 on page 6 shows the forest regions of the world.

Popular terminology has classified trees into two broad categories: softwoods and hardwoods. These terms, however, are only approximately descriptive of the group characteristics. The species referred to as softwoods are nearly all evergreens and produce their seeds in cones; hence the term conifers is somewhat more appropriate. Trees with broad, flat leaves fall almost exclusively into the hardwood group and are mostly deciduous; and the terms "broadleaved" and "hardwood" may be used synonymously.

In the tropical region, where, throughout the year, rainfall is abundant and temperatures are high, the forest is a luxuriant evergreen hardwood forest. The number of tree species in any small area is legion, and variation in the frequency of the occurrence from area to area is great. Many of these species do not show the typical seasonal growth ring so evident in temperate zone species. The trees tend to grow long, unbranched trunks. In areas of the tropics where there is a short dry season, the forest is similar but has smaller and wider-spaced trees and denser undergrowth. These tropical forests are found in extensive areas on the basins of the Amazon and the Congo and in southeastern Asia, the East Indies, the West Indies and the coastal regions

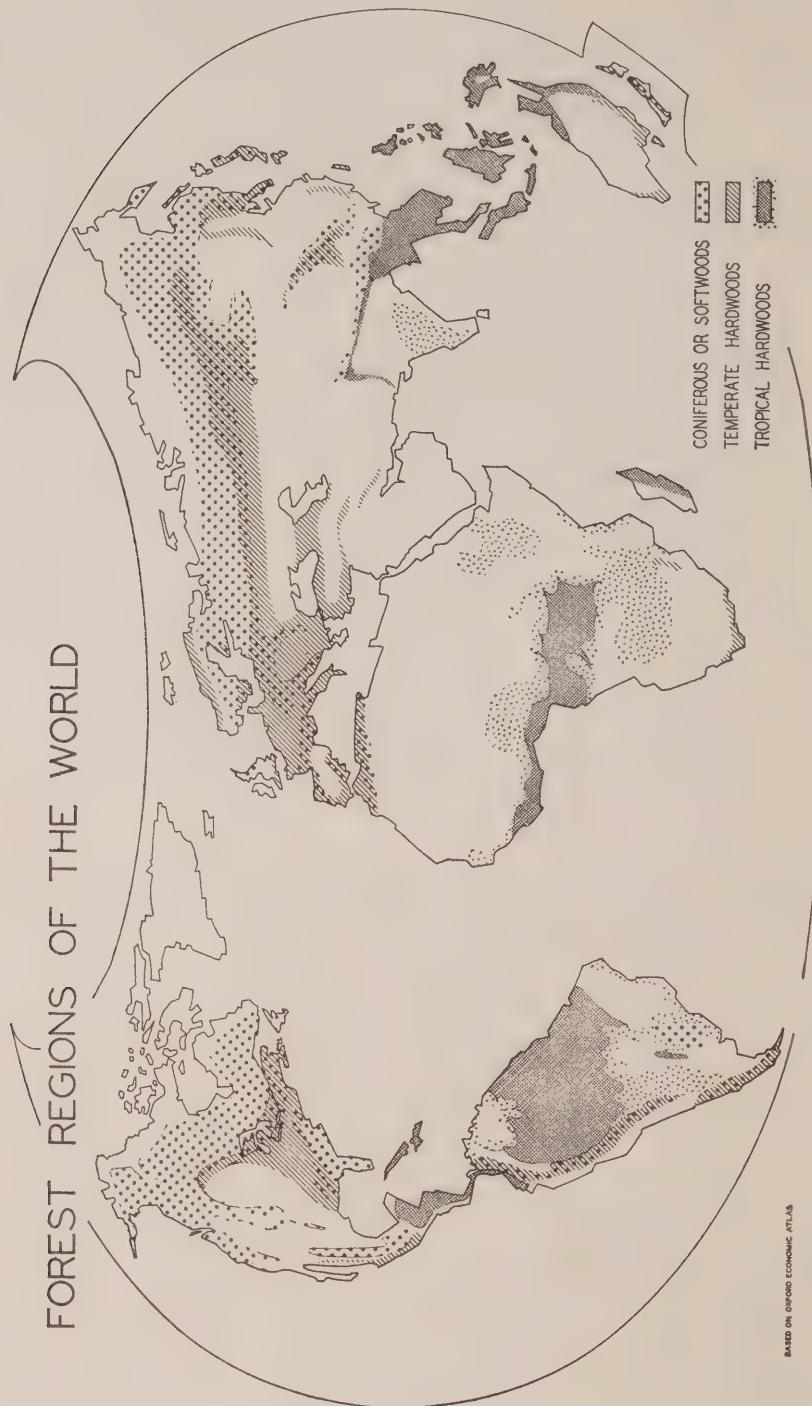


Figure 2

of Central America, northern South America, parts of Africa and of Australia. In the transition to the open grasslands of the drier portions of the tropics, the forest becomes one of scattered, stunted trees and thorny plants. Such forests are extensive in Africa and India.

In the northern hemisphere, the "taiga", a great belt of almost exclusively coniferous trees circles the globe. Here the number of species in any one area is small, and the lightly branched, generally straight stems frequently grow in relatively pure stands of fairly uniformly sized trees. Occasional specimens, or stands, of birch and poplar occur in the region among the spruces, firs, larches and pines, which are the common species. In its more northern areas this forest becomes one of stunted smaller trees intermingling with open or sparsely treed muskeg swamps. This is especially true of northern Canada, where glacial action has removed much of the soil covering the bedrock.

South of this broad belt are other areas of conifers, where mountain climates or soil conditions favour these species over the less hardy broad-leaved species of the mid-latitudes. Most notable of these occurrences is the extension down the mountain range of western North America. Particularly on the moist western slopes near the Pacific coast, the growth rates and the ultimate size of the trees are most striking. Douglas fir, western red cedar, western hemlock and redwood are examples of this. Along the Rocky Mountains the drier climate does not permit such marked development in tree size. Somewhat less spectacular are the coniferous forests of the higher elevations in the Appalachian chain. Valuable conifers also occupy the slopes of many mountain ranges in Europe and Asia, such as the Alps and the Carpathians. On the sandy, relatively dry coastal plain of southeastern United States there frequently occur forests of fast-growing pines, often in extensive stands of straight, uniformly sized stems. In the Southern Hemisphere only spot occurrences of conifers are found, largely because of the lack of land area in the appropriate latitudes.

In the middle latitudes on either side of the tropical forest, the broad-leaved hardwoods tend to become deciduous in adapting themselves to the winter season. Forests usually occur in the moist portions of these regions, giving way to grass or desert in the drier places. Adjacent to the coniferous areas there tend to be large areas of mixed coniferous and broadleaved species. Frequently local site differences favour either type, but often both kinds of trees are found in mixtures in the same area.

Within this belt has occurred much of the development of civilization and the extensions of settled areas. This, together with the suitability of much of the land for agricultural purposes and the local demand for wood, has led to extensive clearings of the forest over the period of man's cultivation of land. Such has been the case in much of Europe, eastern North America and eastern Asia where this forest has covered large areas. Large remnants of

this forest, however, are still found in areas of rougher topography, poorer soil and less settled areas. This hardwood and mixedwood forest is well represented in the Southern Hemisphere as well, in southern South America, Africa, Australia, and New Zealand.

Approximately one-third of the world's forests are coniferous in nature and, as has been indicated, they lie very largely in the Northern Hemisphere. Although Canada has only about one-tenth of the world's forest area, she has nearly one-quarter of the coniferous area. More than one-half of the softwood forest is within the Soviet orbit. However, when volumes of standing timber are considered, Canada, because of the sparse nature of her most northerly forests, has only 7% of the world's timber and 10% of the softwood volume.

Most of Canada lies within the coniferous belt. Only in the southernmost portion, the Niagara Peninsula, does it enter into a truly hardwood region. However, much of southern Ontario, southern Quebec, and the Maritimes have large areas of mixedwood and pure hardwood stands according to local site conditions. North of the Prairies, on the southern border of the coniferous forest, is a considerable area where poplar is the predominant species.

Although man early recognized the superior qualities of many of the hardwood species for heating and also made use of them for their usually greater strength and durability against wear, the ease of working most conifers has given them a place of preference for many uses. The strength of many conifers with respect to their weight, coupled with the large size of some species, has made them valuable for the building trades. The technological developments of nearly a century ago, which made possible the manufacture and use of wood pulps for paper, further advanced the use of the long fibres of many light-coloured, pitch-free conifers. Although the poplars with their softer texture were used in the past for pulps, it was not until recently that appreciable quantities of other broadleaved species were used in pulping processes. Technical developments of about 30 years ago have encouraged the use of great quantities of pine in the manufacture of kraft pulps. Only in recent years have the prospects for hardwood pulps been greatly strengthened by significant developments on the technological front.

Trends in the development and use of wood substitutes have, in many regions, reduced the per capita consumption of fuelwood and wood for construction but have had no appreciable effect on the sharply rising use of wood for pulp production. While total wood consumption continues to increase, the net effect of substitutions has been to emphasize even further the relative importance of the conifers. In recent years slightly more than half of the wood reported removed from the world forests was coniferous. The proportion varies from about 80% in Russia to about 2% in Africa. Nearly half of the total wood removed was used for fuelwood. Although sound estimates

are not readily available, conifers appear to comprise about three-quarters of fellings for industrial purposes.

Accessibility in the forest is largely dependent on the existence of waterways, railways or roads. Until the development of the motor truck and the tractor, the situation favoured the areas of cheap stream driving. In much of the mixedwood and temperate hardwood regions, roads and railroads are readily available. In the relatively untapped tropical forest the immense river systems provide some access but are not suitable for floating the heavy species of the rain forest.

This situation accounts for the inaccessible or unexploited "potential forest resources", primarily in northern Canada, Alaska and northern Russia, and in Africa and South America, particularly in Brazil. The favoured position of conifers in industrial use and the greater uniformity of stands, with the resultant suitability for economical logging operations, have continually led to speculation on the opening up of the northern forest. The often more scattered and smaller nature of the trees, especially in much of northern Canada, will be a deterrent to this development.

The future of the tropical forests, on the other hand, depends on technical advances permitting solutions to the problems of logging and manufacturing a great variety of diverse species found in the same area. Recent developments in the technology of pulp and paper are already greatly extending the potential of the mid-latitudes, especially of the eastern United States, into hitherto uncommercial species and grades of temperate hardwoods.

The pulp and paper industry requires in its manufacturing processes considerable amounts of clear water and cheap power, and here again the coniferous belt has been well favoured.

The distribution of populations, and particularly of industrial populations with high levels of income, is instrumental in determining market locations; and in conjunction with the regional forest conditions it has had much to do with the determination of the pattern of forest utilization on an industrial basis and of the movement of forest products in world trade. North America, Europe and Russia, combined, account for nearly 90% of the industrial wood cut. Per capita rates of final consumption of industrial forest products are especially high in Australia, Canada, Finland, New Zealand, Norway, Russia, Sweden and the United States. A map showing world forests and wood use is presented on page 10 as Figure 3.

In spite of a large output of forest products, the United States, with a high consumption rate and a large population, is a net importer. Canada, Sweden, Finland, Austria and Norway are the largest net exporters of forest products, together accounting for more than three-quarters of the world's

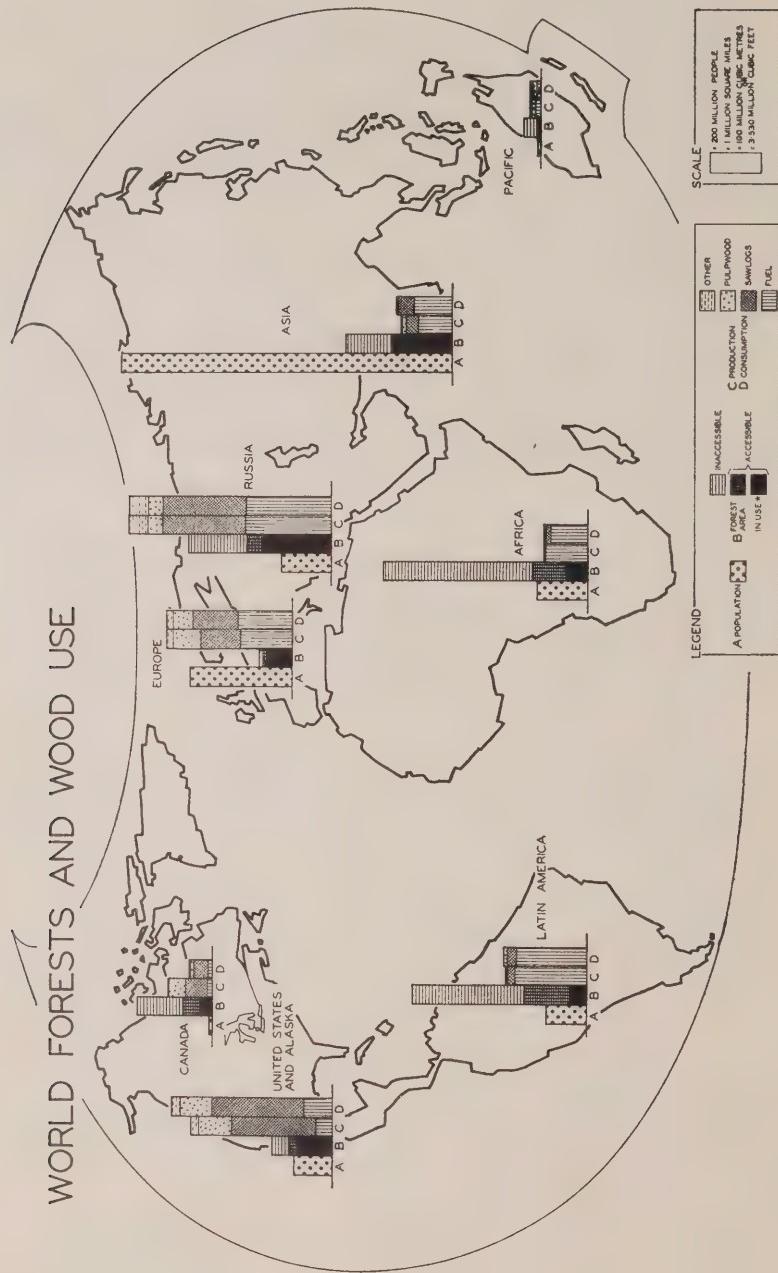


Figure 3

* For the United States, the terms "accessible" and "inaccessible" refer to productive and unproductive forests respectively.
For Canada, the term "inaccessible" applies to all unproductive forests.

volume of such exports. The largest international movement in these goods is from Canada to the United States, particularly in newsprint, wood pulp and softwood lumber. This trade is nearly matched in magnitude by exports from northern and eastern Europe to western and southern Europe. Further movement of forest products from Canada is obstructed by protective tariffs on papers other than newsprint, and by currency restrictions within the non-dollar countries. In these last-mentioned areas the lowness of incomes by comparison with North American levels is undoubtedly a major underlying factor. This is particularly noticeable in Europe, where World War II disruptions resulted in a sharp drop in purchasing power in relation to that of prospering North America. Thus imports would have declined in any case from an inability to compete in North American markets, if not from currency restrictions.

To summarize, Canada, in common with the regions of northern Europe and of Russia, is in a favoured position for industrial wood production because of its predominantly coniferous forests, its proximity to densely populated and prosperous industrial and agricultural areas to the south, and its supply of clear water and waterpower. In spite of the large United States production, the heavy rate of consumption and the high income level of that country place Canada in the forefront of forest product exporters. Tariffs, currency restrictions, and relatively low purchasing power in many countries, are obstacles to increased exports. Major competitive threats are from the increased use of United States hardwoods for pulping; the possibility of technological advances permitting greatly amplified use of tropical hardwoods; and a possible increase in Soviet exports because of increased production or reduced consumption in that area.

HISTORICAL DEVELOPMENT OF CANADA'S FOREST ECONOMY

CANADA is peculiarly adapted to the role of a substantial producer of forest products. Her forest industries were destined to be of major importance in a country of vast extent and possessing many of the climatic, soil and other environmental conditions suitable to the growing of trees. Slowly at first, based largely on growing markets for lumber both on this continent and in western Europe, interest developed in the northern forest as a source of income. An expanding population, and especially metropolitan growth in the United States, augmented the demand for wood as a construction material. Nearby resources were rapidly used up. This condition, plus improving methods of transportation, drew more and more Canadian wood into the North American orbit. Thus, while new products such as newsprint and the pulps have been added to the others, local markets and outlets in adjoining areas in the United States have provided many of the opportunities upon which today's widespread forest industries have been founded. This is not to imply that overseas sales have been unimportant, as they have been of particular value to producers of Canada's east and west coasts. But with markets developing closer to hand on this continent, the tendency has been, inexorably, toward a greater north-south trade in forest products.

Though market factors have had a great deal to do with the shaping of Canada's forest industry, technology and the ever-present threat of resource depletion have also had far-reaching implications. One such implication, for example, has been a profound change in organization. Nomadic enterprises have given way to more or less permanent institutions. The early philosophy of "cut and get out" is being replaced by the idea of management in perpetuity. Nor could it be otherwise. Without timber limits sufficient to support several decades of production, it would be impossible to finance a modern pulp mill. Likewise, a properly equipped and well-integrated lumber, plywood, wood pulp and composite board industry requires limits whose sustained yield is commensurate with its ability to turn out salable products. Vast tracts of Canada's forest land are being managed in this way. They

are being organized to support well-rounded, up-to-date and inherently stable operations. And, with it all, an era is passing—that of the seemingly boundless frontier, the transient lumber mill and, in places, the small or part-time woods operator.

In early colonial times, the forest was often regarded more as an obstacle than as an asset. A few recognized its potentialities, but for the majority the first objective was to clear their land of trees. Used more or less incidentally for construction, as fuel and in a dozen small-volume applications, great tracts of land were cleared with little direct benefit to those who were endeavouring to make Canada their home.

During the French regime, in the latter half of the seventeenth century, lumber requirements for local building led to the construction of sawmills on the St. Lawrence River and in Acadia. Concern over the French naval requirements led to the inclusion of reservations in land grants for oak timber and later for pine. These restrictions were unpopular with the settlers because of the added difficulty in clearing, a most arduous task at best, often accomplished by the use of fire. Some trade with France in lumber and masts was built up, but it was not extensive, and even this declined in the period of the disputed ownership of Acadia, from 1713 to 1763.

With the establishment of British control in Canada, a series of acts and instructions reserved individual pine trees for the Royal Navy and made allowance for the establishment of forest reserves for the production of timber suitable for masts. Although these policies conflicted with the clearing of the new settlements established after the American Revolution, some reserves were set aside for the navy. It was here that the Crown land system of this country had its origin.

After the loss of the American Colonies, the New England trade in white pine masts for Britain and in sawn boards for the West Indies (a trade which had already begun to expand into what is now Nova Scotia) extended further and grew rapidly in the newly established province of New Brunswick, where large numbers of United Empire Loyalists had been granted lands. This Loyalist immigration into the Maritimes and into the St. Lawrence region of present-day Ontario created heavy local demands for lumber, which were supplied by numerous small sawmills.

The cutting of masts and subsequently of timber for the royal dockyards was permitted by licences granted by the British government to contractors. These in turn frequently made agreements with agents for the conducting of operations, a privilege frequently misused to supply the general market.

The Napoleonic Wars, the Continental System and the consequent restrictions on Baltic supplies caused the British government to foster a British North American wood trade by the imposition of high duties on foreign timber supplies. Herein lay the first impetus to Canada's forest industries.

A century and a half ago, New Brunswick led in the export of pine masts, but with the greatly increased trade Quebec soon gained the foremost position in the masting industry and developed a large trade in oak and pine timbers. At the same time an industry was growing in the export of squared pine timbers from the Maritimes and Quebec, hastened by a lessening prejudice against, and an eventual preference for, North American timber. At Quebec City and on the coasts of Nova Scotia and New Brunswick there developed a companion industry in the building of wooden ships, largely for the transport of the bulky export, which lasted until the sailing ship was replaced by steam. A notable feature of Canada's economic life in the first half of the nineteenth century was the growth in the timber trade of the St. Lawrence region, first near Quebec, then on the Ottawa River and, finally, from Lake Ontario and Lake Erie north into the peninsula country of Ontario. By 1865, the squared-timber trade, affected by a period of reductions in the preferential tariffs, had begun to decline, and the sawmill industry was well on its way to replacing it.

During all this time, the administration of the forest, as well as the forest itself, was undergoing marked changes. After the American Revolution, the Loyalists received large numbers of grants of lands, particularly in southern New Brunswick and Southern Ontario. The policy of granting lands for services or for small payments continued in the different provinces in various forms for some time and has continued, indeed, in a more restricted manner, to the present time. Large grants were made to the Church and later to railroad companies.

About the end of the first quarter of the nineteenth century the monopoly system of royal contracts for cutting timber was replaced by a method of licensed cutting on "waste lands" not granted or reserved for naval or military purposes. Under this arrangement revenue was received by the provinces from the forests. The details of the methods varied in the three provinces of Upper and Lower Canada and New Brunswick and developed along somewhat different lines. Nova Scotia for some time followed a procedure of selling these lands. Almost from their inception the licensing systems showed elements in timber disposal methods which are still present—fixed charges per unit of wood cut, sale by auction, upset price and over-bid, limited period of licence, preferential claims on licence renewal, ground rents in addition to the timber dues, and eventually a lengthening of the licensing period. In order to discourage speculation, minimum cuts were established.

From the first, settlers made use of fire in clearing land. Frequently these fires spread and destroyed great areas of timber. Although some early legislation was directed against careless or wanton burning of the forest, little concrete action was taken until quite late in the century. The fires destroyed much of the forest near the settlements. Over most of their optimum range, many of the best specimens of white and red pine were

removed in a period of less than a century. Although the total volume of wood cut was small compared to the amount of standing timber, the inferior quality and frequent destruction of the remainder was to lead to fears of "timber famine".

The sawmills which supplied the local needs of Acadia, New France and the Loyalist settlements were only the predecessors of more and larger mills which were to ship lumber to distant markets. The continuation of trade with the British West Indies had occupied the Maritime Loyalists with the export of lumber, but it was not until about 1825 that sawmill products became important export commodities. A gradual decline of the British prejudice against any wood except squared timber permitted the export across the Atlantic of sawn deals, from two to four inches in thickness. This supplemented the timber trade and allowed the use of smaller pine trees and of the abundant Quebec and Maritime spruce.

After 1850 the sawmill industry was favoured even more by newly developing markets in the United States. Trade in lumber with Canada's neighbour was hastened by the prevalence of local wood shortages in the rapidly expanding communities of the Atlantic coast, by the construction of the great canal systems of New York State and the St. Lawrence region, by the decline and eventual lifting of the preferential tariffs of Britain, by the investment of American capital and by the agreements of the Reciprocity Treaty. During the first part of the sawmill era, operations were carried on in the same general area as the former squared-timber industry. The building of railroads began, about mid-century, to extend the area of exploitation farther from the major waterways and, within three decades, had opened up the pine forests of Georgian Bay and the north shore of Lake Huron and had extended as far west as the Lake of the Woods region.

During the period of rapid growth and the western movement of the lumber industry there were numerous short-term economic fluctuations caused by various circumstances such as tariff structure changes in both Britain and the United States; the Civil War, its postwar slump and the subsequent industrial boom; the opening of the Prairies and the end of the railroad boom.

By the terms of Confederation, the five eastern provinces were left in control of their natural resources as a cornerstone of provincial financing. Their Crown land policies had already been shaped and continued to develop along separate lines. The federal government took over control of the lands previously administered by the Hudson's Bay Company. It still manages the parts of that area which are now the Yukon and Northwest Territories. In 1930, however, the provincial authorities were given ownership of what are now the Crown lands of the Prairie Provinces and of the railway belt which British Columbia had given to the Dominion as one of the terms of its entry into Confederation.

Lumber for the building of the Prairies was initially supplied from the western edge of the pine belt. With the western movement of the two railroads, mills sprang up at every waterway to cut spruce from the northern forests. It was in British Columbia, however, that the Canadian lumber industry reached its latest and greatest area of development. The first recorded exploitation of the province's forests occurred toward the end of the eighteenth century with the export of small quantities of masts and spars. From 1827 until late in the century, the sawmill industry grew slowly on a small, but world-wide, export trade and on a local demand which was strengthened by the activity produced by the gold discoveries on the Fraser River. It was the building and completion of the Canadian Pacific Railway and the resultant link with the expanding settlements of the Prairies which gave the industry its first spurt of rapid growth. From this time British Columbia lumber production shot upward at a phenomenal rate, approximately doubling in quantity every decade until the reverses of the 1930's. The reasons for this expansion will become clearer as the developments of the last half century are summarized.

In the last third of the nineteenth century there occurred a tariff struggle between Canada and the United States centred about the lumber industry of the Great Lakes area. After the cessation of Reciprocity, the United States import tariff on lumber was countered by a Canadian export tariff on sawlogs. Over the next three decades a series of moves and counter moves, in which each country attempted to protect its own sawmill industry, culminated in the prohibition of sawlog export from Ontario Crown forests and in a tariff on lumber exported to the United States. Other provinces followed in restricting, in some form, the export of roundwood from Crown lands.

In the meantime, technological developments destined to cause great changes in the forest economy were in progress. The paper manufacturing industry, faced with growing North American demands, had outrun its supply of rags from the cities and had turned to the straw of the agricultural belt. In rapid succession a series of new processes made available to the industry many of the vast forest resources. Processes for the manufacture of both mechanical or groundwood pulp and various chemical wood pulps were put in operation during the span of a quarter century at the time of Confederation. Spruce and balsam fir and, to a lesser extent, hemlock and poplar were favoured in these earlier processes, and the first mills were built in the same areas of North America which had fostered the timber and lumber industries and which had large supplies of these species. The regional nature of demand caused the initial establishment of the industry to be predominantly in the northeastern United States, but the Canadian pulp and paper industry was in the forefront of development and was soon to play an increasingly important role.

The passing parade of forest industries — the production of masts, squared timber, lumber, and now pulpwood and wood pulp, through the use of increasingly smaller sizes and so-called inferior species; the shift from wanton destruction and burning of an overabundant forest to a condition of severe local shortages; and the continual western migration of lumbermen brought about vigorous warnings of timber famine and a new attitude of forest conservation. New policies, sometimes extreme and misguided, were formulated. This movement first developed in the United States, but it soon spread to Canada. The three leading provinces in forest production—Ontario, Quebec and New Brunswick—all passed laws concerning the control of forest fires and limiting the minimum size of trees or logs which could be cut from Crown lands. Lack of adequate provision for the administration of these laws frequently made them ineffective, but even before the turn of the century forest services were being formed by the federal government and by some of the provinces. Others followed shortly afterwards.

The events of the last third of the nineteenth century had prepared the way for the many changes which were to be brought about in the first 25 years of this century. For more than a decade the great Prairie expansion continued to encourage the rapid development of the British Columbia lumber industry. The United States market for lumber continued to grow and brought eastern Canadian production to levels unsurpassed even after World War II. General market acceptance of spruce boards and deals gave to eastern Canada an opportunity to maintain her position until after World War I, but the shift of the major portion of production to the West was inevitable. The constant drain on the supply of timber had led to more and more expensive production because of the decreasing size and quality of logs, increasing distances and sparser stands of timber. By contrast, the superb quality of the magnificent timber of the coast region of British Columbia was relatively untapped. Already the railways and the Prairie development had started the shift.

Just prior to the war, two events occurred which were to influence this transfer of production, although their effects were not fully felt until the 1920's. In 1911 and 1913 tariff changes in the United States, which permitted free entry for newsprint and wood pulp, favoured a movement of certain segments of the North American pulp and paper industry into eastern Canada to compete with the lumber industry for supplies of spruce and fir and for ownership or control of forest lands. The completion of the Panama Canal in 1914 shortened the sea routes from British Columbia to the northern Atlantic, to the lumber markets of Europe and to the eastern seaboard of North America.

The severe economic fluctuations of the few years following the end of hostilities in 1918 brought about conditions which hastened the transformation of the structure of the forest economy. Heavy postwar demands

which culminated early in 1920 allowed western lumber production to continue its growth and the eastern industry to experience a period of unstable prosperity. The sudden slump of 1920 and 1921 merely caused a temporary setback to the industry in western Canada but dealt the sawmills of the older provinces a blow from which they never recovered. The financial difficulties of the lumberman gave to the rapidly developing pulp and paper industry ready opportunity to procure reserves of forest land to back up the large capital investments in new mills. During the building boom of the late '20's, the eastern industry was forced to compete, even in home markets, with west coast lumber. In the meantime, the pulp and paper industry had surpassed the United States in newsprint production and had established itself as world leader in that field of manufacture. In the great spurt of growth, mill capacity had outrun demand even before the economic disaster at the end of the decade.

The bitter depression of the 1930's changed even further the Canadian forest industries. United States consumption of lumber was greatly decreased and imports from Canada were further affected by new tariff barriers. Canadian demand was also greatly reduced. By contrast, a building boom in the United Kingdom, coupled with the incidence of British preference, led to a sharp increase in Canadian exports to Commonwealth countries, much of it at the expense of United States Pacific coast exporters. This demand was supplied in large part by west coast mills, but in the East small portable sawmills (which tended to replace the larger mills of the previous era) took advantage of the overseas market to log scattered areas of sawlog stands. In spite of this, production in 1932 fell to less than two-fifths of the 1929 peak. The pulp and paper industry, which suffered relatively less production curtailment than did the lumber industry, was faced with prices which remained depressed until late in the decade. Many of the companies were forced into receivership. Stock-piling by United States consumers at low prices which prevailed in 1937 caused production to decrease with the improved prices of 1938.

Since the beginning of World War II, the growth of the Canadian forest industries has slackened only because of labour shortages toward the end of the war period and a short business slump just prior to the events in Korea. The more recent developments are considered in some detail in the following chapters.

During the early part of the century most of the provinces had established forest services which had considerable success in controlling forest fires. These organizations also had taken some notable forward steps in managing the public forests, including the taking of inventory on forest lands. Many of their restrictive policies, however, were tempered by economic pressures. Timber-cutting regulations were often relaxed to encourage the establishment of industry and to maintain all possible activity

during the difficulties of the 1930's, when export restrictions were made less rigorous. Several provinces, by this time, had required the preparation of management plans as one of the conditions of lease, particularly when cutting restrictions were eased, but here again exceptions were made in individual circumstances.

The historical development of forest land policies has resulted in a pattern of ownership and tenure which varies greatly from province to province. In areas of old settlement, the early policy of granting or selling lands has resulted in almost complete private ownership of the remaining forest. Forest land of this type makes up more than one-quarter of the area classed as "occupied forest land". The Maritime Provinces (with the exception of northern and central New Brunswick), the southern portions of Quebec and Ontario and the southwestern part of Vancouver Island account for much of this land. Elsewhere, the forest land is owned and administered largely by the Crown. The methods of control and disposal of timber will be considered in a later chapter.

The forest industries show a strong tendency toward vertical integration. That is, industrial organizations which manufacture and sell pulp and paper, lumber and other forest products usually supply their raw materials by conducting logging operations on lands which they own or on public lands upon which they hold certain cutting rights. This is particularly true of the pulp and paper industry, which owns nearly one-fifth of the private forest land and which has partial interest in approximately four-fifths of the public forests currently licensed for production. This industry supplies about two-thirds of its wood requirements from these sources. The lumber industry likewise owns or controls appreciable areas of forest but is more dependent on the market for its supply of sawlogs. More than one-third of the private forest land is in the form of farm woodlots which provide most of the nation's fuelwood as well as a significant portion of the market sawlogs, pulpwood and miscellaneous forest products. There is also a considerable area owned or operated by companies or individuals for the purpose of supplying wood to the market. Abandoned farm lands, particularly those where natural reproduction has been adequate or those suitable for planting, are often acquired by such organizations or by pulp and paper companies.

Technology has continually played a role in determining the products of the forests and the areas from which they come. The masts and spars of wooden ships gave way to steam engines and iron hulls. Sawmills produced deals and boards to replace squared timbers. Canals reached to new markets. Railways made accessible more forests, hauled lumber to developing areas and used large quantities of ties. Pulpwood was used in lieu of rags and straw for the manufacture of paper. Steel girders and asphalt products brought new qualities to substitute for the wooden beams, flooring and shingles which were increasing in cost. Motor trucks and bull-dozers supple-

mented the stream drive and the horse-drawn sleigh. Paper bags and paper-board cartons proved cheaper and often more efficient than barrels and boxes of wood. Veneers and plywoods and composition boards brought economies and variety to furniture manufacture and to the building trades. Coal and oil have eased the labours of heating. The constant forces of relative scarcity, beauty and utility have caused wood to replace and to be replaced.

Areas of production have spread with the tide of settlement and with new forms of transportation. Exploited areas have been abandoned and later redeveloped with the return of the forest or for the recovery of formerly unwanted products. The wild forest with its accumulated wealth of generations has been utilized for quality materials and often destroyed. New forests have grown and been harvested. Liquidation of the forest's unmanaged capital stock has gradually given way to a conscious handling of forests for sustained yield.

Public policies have moved with the changing economic scene, through a conflict of influences concerned with preservation for the future and with the fostering of industry, toward the aim of continuous high-level production. With the development of new techniques and products, the seemingly profligate use that prevailed in the past has given place to a more nearly complete utilization of the resource.

The changes that have occurred in the pattern of the forest industries during the period since World War I—a span of time much less than the growing period of the average forest crop—have been striking. The total harvest of wood has approximately doubled. Fuelwood, which four decades ago made up nearly one-half of the total wood cut, has been affected by a marked decline in consumption, particularly in recent years, and now accounts for only one-tenth of the total volume. By contrast, the pulpwood cut, which then made up less than one-fifth of the quantity, now amounts to nearly one-third of the total. Logs for the manufacture of lumber and veneer have more than doubled in quantity and now account for two-fifths of the forest harvest. Other primary products have never made up as much as 10% of the cut and are becoming relatively less important in terms of wood volume.

Regionally, marked changes are also occurring. The western shift of forestry operations continues, although the Atlantic region remains an important factor in the production and processing of forest products. The forest industries in Quebec and Ontario continue to expand, and together they now make up approximately 60% of the net value of all Canadian forest industries. British Columbia has replaced Ontario as the second largest pro-

ducer, following close behind Quebec's lead.¹ The net value of the British Columbia forest industries has more than trebled in the past 20 years owing to a variety of circumstances, one of which is the integration of the forest industries resulting in much closer utilization of sawmill residues and former logging waste. The forest industries of the Prairie Provinces are growing steadily, and increasing quantities of commercial timber are being cut in the Yukon and the Northwest Territories.

The areas of undeveloped forest resources are most extensive and are not too distant from some of the most rapidly growing industrial markets of North America, such as the Pacific Northwest and the western United States. Transportation across the Pacific and through the Panama Canal to the markets of eastern North America, to the Far East and to western Europe is also available. It is therefore reasonable to expect that the vast region west of the Great Lakes is likely to experience a proportionately greater increase in forest-based activities than the eastern Canadian provinces in the years that lie ahead.

¹In the country as a whole the forest industries account for approximately one-seventh of the net value of primary and secondary production. The emphasis, of course, varies from province to province. In Newfoundland, British Columbia and New Brunswick woods operations, lumbering, pulp and paper and other wood-using industries (exclusive of the printing trades) make up more than one-third of the net value of production.

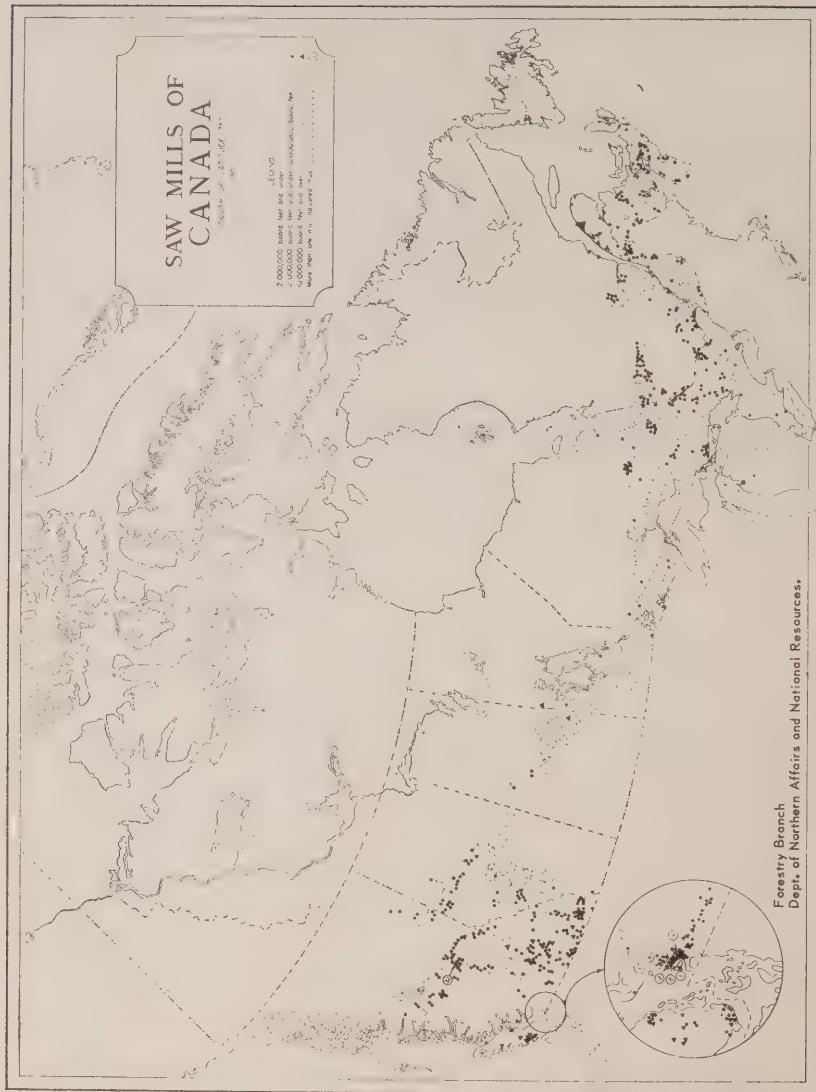


Figure 4

LUMBER AND ALLIED PRODUCTS

Summary

This chapter is a study of the lumber and allied industries in Canada. The products included are sawn lumber (planks, boards, flooring, squared timbers, sawn ties, etc.), veneer and plywood, shingles, insulation board and hardboard. They have the common characteristics of being used mainly for building and construction. Lumber is by far the most important of these products, in both the value of production and the volume of wood used. The relative importance of the products is shown in Tables 3 and 4.

Table 3

VALUE OF PRODUCTION OF LUMBER AND ALLIED PRODUCTS
(thousands of dollars)

	1950	1951	1952	1953	Average 1950-53
Lumber (softwood and hardwood).....	422,481	507,650	483,195	494,386	476,928
Veneer and plywood.....	54,429	72,522	73,126	97,260	74,334
Shingles.....	31,808	27,977	19,270	19,898	24,738
Fibre building boards.....	10,790	14,528	13,522	14,947	13,447

NOTE: Value of production is the selling value at point of manufacture.

SOURCE: Dominion Bureau of Statistics.

Table 4

VALUE OF EXPORTS OF LUMBER AND ALLIED PRODUCTS
(thousands of dollars)

	1950	1951	1952	1953	1954	Average 1950-54
Lumbera.....	292,443	313,104	300,551	288,246	329,366	304,742
Veneer and plywood.....	12,315	18,046	18,655	19,025	21,555	17,919
Shingles.....	32,401	27,483	19,642	20,913	24,182	24,924
Fibre building boards.....	689	2,327	2,097	1,764	1,477	1,671

a Lumber includes planks and boards, hardwood flooring, square timber and railroad ties.

NOTE: Value of exports is the exporter's selling price, which includes profit and, in some cases, transportation to a central point.

SOURCE: *Trade of Canada*, Dominion Bureau of Statistics.

The Canadian Lumber Industry

1. Introduction

Background of the Canadian lumber industry

There is a great range in the size of the sawmills and lumber companies making up the Canadian lumber industry, and also in the quality and types of products turned out. At one end of the scale are the large lumber companies of the coast region of British Columbia with several sawmills and an annual lumber production exceeding 100 million board feet. These large companies maintain sales offices in such major world centres as London, New York and Sydney. They have large modern plants which turn out high-quality products. The lumber is carefully graded according to rules which have been established to service the particular markets to which the lumber is shipped. In recent years the British Columbia coast lumber industry has become more and more integrated, so that today most large companies produce some of the other forest products such as plywood, shingles, doors or pulp and paper. They are in fact forest products companies which produce large quantities of lumber.

At the other end of the scale is the very small sawmill operated by a few men for only a few days a year, which may cut 10 or 20 thousand board feet of lumber valued at a few hundred dollars. The lumber cut may be for the use of the operator or for sale to the local community.

Between these extremes lie the greatest number of mills and the group which produces most of the lumber in Canada. The structure of the industry is discussed more fully farther on.

Sawmilling is one of the most important manufacturing industries in Canada today. In 1954 sawmills employed 57,010 persons and the selling value of shipments was \$572 million. Sawmills accounted for 5% of the persons employed and 3% of the value of factory shipments in all manufacturing industries in Canada.

In recent years sawmills have ranked as the sixth most important manufacturing industry on the basis of the value of factory shipments. Sawmills have held a leading place for many years and were relatively more important in earlier years. In 1922, for instance, sawmills were ranked fourth, and in 1929 fifth, among the manufacturing industries. The lumber industry was in a lower position during the 1930's, largely because it was operating at a very low level. In 1933 it was fourteenth and in 1939 eighth.

The industry is widely spread across the country, lumber being produced in all ten provinces, but it is much more important to some regions than to others. In British Columbia in 1953, sawmill employees made up 30% of all employees in manufacturing industries, and the selling value of shipments from sawmills was 24% of the value of all manufacturing industry shipments. The corresponding data for other regions in 1953 were: the Atlantic provinces, 12% of employees and 6% of the value of shipments; Ontario and Que-

bec, 2% of employees and 1% of the value of shipments; the Prairie Provinces, 6% of employees and 2% of the value of shipments.

Lumber exports

As an export commodity, lumber has been, and remains today, in the front rank. For the years 1950 to 1954 the average annual value of lumber exports was \$302 million, compared to total exports of \$3,867 million. The value of lumber exports was thus about 8% of the value of all exports for this period. In recent years planks and boards have ranked as the third most important export commodity, according to Dominion Bureau of Statistics classifications. In 1910, planks and boards were second, in the late 1920's fourth and in the late 1930's between fourth and sixth.

Lumber in relation to other forest industries

The sawmill industry uses slightly more than half of the industrial wood produced in Canada. For the years 1950 to 1953, the average annual production of industrial wood in Canada was 2.7 billion cubic feet. Of this amount, the sawmill industry consumed an average of 1.4 billion cubic feet, or 52% of the total.

With regard to employment, the sawmill industry up to 1953 employed more persons than any other forest products industry. However, total earnings of employees are lower than earnings in the pulp and paper industry. Of the forest industries, sawmilling is second only to pulp and paper in net value and gross value of production. For the four years 1950 to 1953, the gross value of production of the sawmilling industry was 49% of the gross value of production of the pulp and paper industry. Because these two industries are of prime importance in the utilization of Canada's forests, comparative data for several years are shown in Table 5, together with data for the veneer and plywood industry.

Canada in the world lumber picture

The data in Table 5 indicate the importance of the lumber industry among the manufacturing and forest industries of Canada. On a world basis, Canada is the third largest producer of lumber. Total world production of lumber averaged about 100 billion board feet¹ for the years 1951 to 1953 inclusive, and Canadian production for these years averaged 7.8 billion board feet or about 8% of the total.² Canada's position in softwood lumber production is relatively greater. For the same period, world softwood lumber production averaged about 79 billion board feet while Canadian production was 7 billion board feet.³

¹Production of lumber in the world excluding Russia was reported to average 75.3 billion board feet for the years 1951 to 1953. Production in Russia is estimated to have averaged about 25 billion board feet for these years (see footnote to Table 6).

²The definition of lumber as used by the Food and Agriculture Organization of the United Nations is not directly comparable with that used for this study. For instance, data for total lumber production include box boards; data for softwood lumber production do not include box boards. Figures for Canada are revised F.A.O. estimates.

³Free World production of softwood was reported to average 57.3 billion board feet for the period. Softwood production in Russia is estimated to have been between 21 and 22 billion board feet.

SOURCE: *Yearbook of Forest Products Statistics*, F.A.O.

Table 5

**ECONOMIC DATA OF THE LUMBER, PULP AND PAPER,
AND VENEER AND PLYWOOD INDUSTRIES**

Year	Employment			Earnings of employees (thousands of dollars)		
	Lumber	Pulp and paper	Veneer and plywood	Lumber	Pulp and paper	Veneer and plywood
1928.....	44,862	33,614		34,722	47,323	
1938.....	31,182	30,943		25,345	42,619	
1948.....	56,756	51,924	6,335	95,066	151,663	12,529
1950-53 average....	60,750	56,408	7,628	130,306	210,878	19,597
	Gross value of production (thousands of dollars)			Net value of production (thousands of dollars)		
Year	Lumber	Pulp and paper	Veneer and plywood	Lumber	Pulp and paper	Veneer and plywood
1928.....	139,425	233,077		58,161	120,040	
1938.....	92,856	183,898		39,265	89,034	
1948.....	409,267	825,858	49,209	196,936	412,770	28,582
1950-53 average....	559,304	1,132,397	74,334	260,371	593,609	40,571

SOURCE: Dominion Bureau of Statistics.

In lumber exports, Canada ranks first and has exported in recent years about twice as much lumber as the second ranking exporter, Sweden. From 1951 to 1953, Canada's exports of lumber averaged 3.6 billion board feet, compared to total world exports of 10.7 billion board feet or about 34% of total world exports. Exports from three northern European countries (Sweden, Finland and Norway) averaged 3.2 billion board feet. For the same period, softwood lumber exports from Canada averaged 3.5 billion board feet, compared to 9.6 billion board feet for world exports, or approximately 36% of the total. Production and exports of lumber for several of the important producing countries are shown in Tables 6 and 7.

Table 6

**PRODUCTION OF LUMBER
IN THE MORE IMPORTANT PRODUCING COUNTRIES**
(softwoods and hardwoods)

	Average annual production 1951 to 1953 (millions of board feet)
Canada.....	7,756
United States.....	38,075
Japan.....	5,841
West Germany.....	3,370
Sweden.....	2,717
France.....	1,958
Finland.....	1,791

NOTE: Lumber production in Russia has not been regularly reported in recent years but is estimated to have been 25,643 million board feet in 1952 and 27,136 million board feet in 1953.

SOURCE: *Yearbook of Forest Products Statistics*, F.A.O.

Table 7

**EXPORTS OF LUMBER
FROM THE MORE IMPORTANT EXPORTING COUNTRIES**
(softwoods and hardwoods)

	Average annual exports 1951 to 1953 (millions of board feet)
Canada	3,638
Sweden	1,696
Finland	1,409
Austria	1,091
United States	704

NOTE: Lumber exports by Russia have not been regularly reported in recent years but are estimated to have been 261 million board feet in 1952 and 598 million board feet in 1953.

SOURCE: *Yearbook of Forest Products Statistics*, F.A.O.

The reason for this dominant situation in the lumber trade is that Canada has had very large sawtimber resources and has been able economically to manufacture much more lumber than is required domestically, and also that the industry is located relatively close to the large consuming markets in the United States. Figure 5 shows world lumber production trends for selected years from 1913 to 1953.

Distribution of Canadian lumber

Approximately half of Canadian lumber production has been exported during the period since 1920. During the latest 5-year period for which data are available (1950 to 1954), 51% of production was exported. Actually, consumption of lumber in Canada was slightly larger than exports, as Canada has imported small quantities of lumber. These relationships are shown in Table 8 for four different periods. The sum of production and imports is shown as "available supply" and exports and consumption are shown as percentages of available supply.

Canadian lumber has been and is today shipped to a very large number of markets spread widely around the world. Outside of the United States and the United Kingdom, however, no one country has ever taken a very large percentage of the total. During the 5-year period from 1950 to 1954, the United States took 71% of Canadian exports of "planks and boards" and the United Kingdom took 20%. The next most important market, Australia, took 2% during this period. Data for exports of "planks and boards" to the ten most important markets are given in Table 9.

The distribution of Canadian lumber follows a fairly complex pattern. The United States market is important for every major producing region. It is all-important for some regions, for instance the interior region of British Columbia, which does not ship lumber overseas. The coast region of British

Columbia is the main source of Canadian lumber for the United Kingdom. On the other hand, averaged over the past five years, the United States has been the largest market for coast lumber. For the eastern industry, the United States is the most important export market, but significant amounts of lumber are shipped from the Maritime Provinces and Quebec to the United Kingdom.

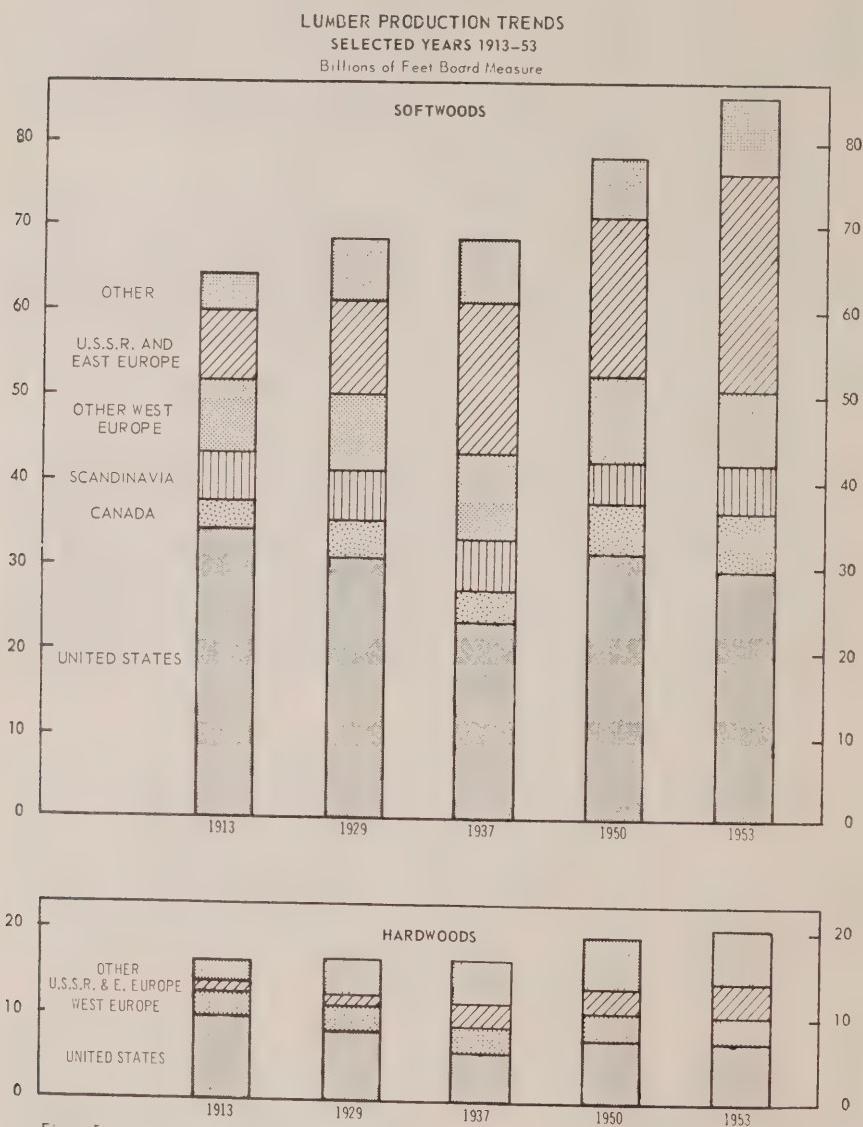


Figure 5

Table 8

PRODUCTION, EXPORTS, IMPORTS AND CONSUMPTION OF LUMBER
IN CANADA
(millions of board feet)

Period	Production	Imports	Exports		Consumption ^b	
			Quantity	Percentage	Quantity	Percentage
1926-30.....	4,270	201	1,988	44.5	2,483	55.5
1936-40.....	3,958	90	2,068	51.1	1,981	48.9
1947-49.....	5,901	80	2,464	41.2	3,520	58.8
1950-54.....	6,972	140	3,557	50.0	3,555	50.0

a Available supply is equal to production plus imports.

b Consumption is apparent consumption: production plus imports minus exports.

NOTE: Totals may not add because of rounding.

There is also considerable movement of lumber within Canada from region to region. In general, the movement is from the two ends of the country to the large markets in central Canada. The British Columbia industry, both coast and interior, ships important quantities to the Prairie Provinces and to Ontario and Quebec. In the opposite direction lumber is shipped from the Maritimes to Montreal and Toronto and other central markets.

Table 9

EXPORTS OF PLANKS AND BOARDS FROM CANADA TO MOST IMPORTANT MARKETS

(annual average, period 1950-54)

	Millions of board feet	Percentage	Cumulative percentage
1. United States.....	2,537	71.5	71.5
2. United Kingdom.....	697	19.6	91.1
3. Australia.....	80	2.3	93.4
4. South Africa.....	72	2.0	95.4
5. Ireland.....	28	0.8	96.2
6. British West Indies etc. ^a	17	0.5	96.7
7. Rhodesia and Nyasaland.....	15	0.4	97.1
8. Portuguese Africa.....	15	0.4	97.5
9. New Zealand.....	11	0.3	97.8
10. Hawaii.....	10	0.3	98.1
11. All other Countries.....	66	1.9	100.0
Total exports	3,548	100.0	

^a Bermuda, British Guiana, Barbados, Jamaica, Trinidad, Tobago, Bahamas and Leeward and Windward Islands.

SOURCE: Dominion Bureau of Statistics.

2. Characteristics of the Lumber Industry

Number and size of mills

A fundamental characteristic of the lumber industry is the very large number of mills in the country and the small size of most of them. Actually, there is a very great range in the size of mills, and some mills are relatively large factories.

In 1953, 8,194 active sawmills reported production to the Dominion Bureau of Statistics. In addition there were probably more than 1,000 very small mills, production of which was not reported in that year but which probably accounted for only about 1% of total output.

The number of mills in Canada, classified by annual production, is shown in Table 10.

Of the 36 mills which reported production of more than 20 million board feet in 1953, 31 were located on the coast of British Columbia, three were in the interior of British Columbia and two were in Ontario.

Table 10

SAWMILLS BY SIZE CLASS OF PRODUCTION, 1953

Size class: annual production in M.F.B.M.	Number of mills	Percentage of number	Percentage of production
Under 200.....	4,197	52.8	4.2
200-499.....	1,516	19.1	5.9
500-999.....	934	11.7	9.0
1,000-4,999.....	1,112	14.0	31.9
5,000-14,999.....	141	1.8	15.5
15,000-19,999.....	19	0.2	4.5
20,000 and over.....	36	0.4	29.0
Sub-total.....	7,955	100.0	100.0
Specialty mills.....	239		
Total.....	8,194		

It may be seen that about half of the lumber was cut by the 196 mills cutting 5 million board feet or more. The 5,713 mills in the two smallest size classes, 72% of the total number, produced 10% of the lumber cut. In eastern Canada the bulk of the lumber is produced by mills cutting between 1 million and 5 million board feet a year. In British Columbia larger mills are more important; and in 1951 mills cutting more than 10 million board feet accounted for 61% of provincial production. While the small mills may appear relatively unimportant in the national picture, they are very important to certain regions and perform a worthwhile service in utilizing forest resources.

One reason for this pattern is that sawmills tend to locate as close as possible to the source of raw materials. Timber loses a great deal of weight in the process of being manufactured into lumber. Considering that the bark, sawdust, planer shavings, slabs and edgings are all removed in manufacture, and that the lumber may be dried before shipping, the weight of the finished product may be less than half the weight of the raw material. Transportation cost of the raw material thus becomes an important cost item, and locating the mill as close as possible to the timber keeps transportation costs to a minimum. Mills are designed therefore only to be of such size as to operate on the timber within a relatively small radius. Many mills are semi-portable and will set up for from three to five years' operation.

This tendency to scatter the industry results not only in small mills but also in the scattering of the left-overs and sawmill waste. Such material is of low value for its weight and cannot be moved far for use by the pulp or other wood-consuming industries. In this situation collection costs are high and in many instances the costs of collection, processing and transportation of waste wood to other mills will exceed the value of material. Also, the small quantity of material at the smaller mills will not support the equipment required for processing. This is one of the fundamental problems of the lumber industry in eastern Canada, stemming from the basic structure of the

industry. Because of small size and location, many of the mills are unable to make full use of their raw material.

The situation on the coast of British Columbia is quite different. In this area logs are moved by towing in the water and may be moved hundreds of miles cheaply in this way. Most sawmills are located on the southern coast, and many draw timber supplies from far to the north, up the coast. This has allowed the establishment of large mills and a concentration of material at one point. It has also allowed low-cost transportation of waste wood products to pulp mills. Further, it permits the exchange of raw materials between manufacturing plants. A log once in the water can be easily shipped to a pulp mill, plywood plant or sawmill. The coast industry has made great progress in timber utilization and in the integration of operations in the past few years. The progress rests in part on the ability to move logs cheaply.

Entry into the lumber industry is fairly easy. A few thousand dollars is sufficient to start up a small mill. Because of the basic and undifferentiated nature of the product, there are no difficult marketing or promotional problems. Only a few skilled men are needed for the operation of a small or medium-sized mill. Raw materials are fairly easy to get on a small scale. In times of high prices many small mills come into production; when prices drop, many close down. This means that there is a tendency to over-capacity in the industry.⁴

This classification of sawmills by value of sales, as shown in Table 11, indicates that most are small compared to plants and companies in some other industries.

Table 11

SAWMILLS CLASSIFIED BY GROSS SELLING VALUE OF PRODUCTS, 1953

Size class: gross value of products	Number of mills	Gross selling value of products	
		Thousands of dollars	Percentage
Less than \$100,000.....	7,307	132,016	23
\$100,000 to \$999,999.....	808	202,159	35
\$1,000,000 to \$4,999,999.....	65	118,412	20
\$5,000,000 and over.....	14	128,107	22
Total.....	8,194	580,694	100

SOURCE: Dominion Bureau of Statistics.

Most sawmilling businesses are under individual ownership or partnership. These two types of ownership accounted for 31% of the value of the products made in 1953. While there are many incorporated companies in the sawmill business, it is probable that the stock in most is held by a small

⁴Over-capacity in the sense that the existing plant is capable of producing more lumber than is actually produced.

number of individuals, in many cases members of a family. Considerable lumber is cut in eastern Canada by pulp and paper companies whose shares are, of course, widely held and traded on the exchanges; and several, but by no means all, of the large lumber companies in British Columbia have wide public ownership of their stock. The situation, however, particularly as regards areas other than the coast of British Columbia, suggests that the lumber industry may not be in a strong position to attract new capital.

Nature of raw material

Sawlogs, the raw material of the sawmill industry, are not a uniform commodity. There is great variation in the size and quality of timber, and several different species are cut. The size of logs has an important bearing on the profitable operation of a mill: large logs, as a rule, are cut at a lower average sawing cost than small ones. The logs which any mill receives vary widely in diameter, and the sawmill must, of course, be designed to handle the largest that regularly come in. When sawing smaller logs, the mill is, in a sense, being operated at less than capacity.

Timber contains many defects such as knots, rot, pitch and stain, all of which affect the manufacturing process and manufacturing costs. The manufacturing process is designed to produce the maximum amount of higher-grade lumber. Since there is a wide price spread between the lower and the higher grades, a reduction in the percentage of higher grades produced could mean losses for a mill. This is particularly true of the white pine and the hardwood industry. Attention, therefore, must be given to the size and quality of sawlogs, and attempts made to avoid using logs that will not pay their way. In practice it is probable that a certain percentage of the logs cut by some mills (the smallest diameter logs or logs with the largest percentage of defect) are not profitable to cut, for the operators have not the information required to enable them to determine the minimum size of profitable log.⁵

Manufacturing

Most sawmills produce a fairly wide variety of sizes and grades of lumber, which are partly a reflection of market demand and partly a result of the size and quality of logs being cut. From all logs a substantial percentage of lower-grade material is cut, and little can be done to eliminate it. It is often a problem to dispose of these lower grades and they often bring very low returns. A recent development toward the solution of this problem has been the introduction of glued-up panels which are made of short, clear sections cut from low-grade lumber.

Because of the variability of the raw material, the large number of sizes produced, the defects in the product and the need to produce as high a per-

⁵Studies carried out by the Forest Products Laboratories of Canada on sawmilling in the Maritimes show that it is unprofitable to saw balsam fir trees less than 7.4 inches in diameter and spruce trees less than 6.4 inches in diameter at breast height.

centage of top grades as possible, automatic processes have not been widely adopted by the industry. Every log has to be sawn in its own special way. Every piece of lumber must be examined, graded and routed to the proper machine for further processing or to have defects cut out. The variety of sizes and grades means that hand sorting is required. Attempts have been made to eliminate hand labour from the sorting and piling process but with only moderate success up to now. Some mills sort for length automatically, and automatic stackers have come into use in the larger mills. Technically it may be possible to sort by machines and instruments for width, length and thickness and even for grade. But it would require a very large plant to handle such a process and it would be beyond the means of small and medium-sized mills.

Sawmilling companies do not have research departments, nor is there an industry research programme. The Forest Products Laboratories of Canada carry out most of the research work in sawmilling done in Canada. In machine development, machinery manufacturers probably contribute most. Sawmilling being a fairly simple process, perhaps there has not been the same need for the employment of highly trained engineers and scientists as in other industries. However, as will be apparent later, the industry will have to devote more attention to research, and, in fact, there has been evidence of a growing interest in recent years.

Marketing

Lumber generally moves to market from the mills through wholesale and retail yards. Some wholesalers maintain concentration yards in which they collect lumber from several mills, sort it and give it further treatment before shipping it to retailers. There are also wholesale offices which do not take physical possession of the lumber but provide the contact between buyer and manufacturer and arrange shipping and financing. Some of the larger manufacturers maintain sales offices and wholesale yards in the larger cities. Retailers maintain stocks of lumber in the consuming areas and sell to final consumers. This is only a very brief outline of lumber marketing arrangements; actually there is considerable variation in these arrangements. Some large consumers buy directly from mills. Some firms carry out manufacturing, wholesaling, retailing and exporting functions.

In general, the manufacturer has no direct contact with the consumer. Lumber is a bulk commodity, and most of it loses its identity when bought by a wholesaler. Also, most retailers today sell not only lumber but a whole range of building materials including plywood and hardboards. Most retailers will probably sell their customer the product which they feel will best suit his needs, whether it is lumber or some other manufactured material.

Compared with many other producers, individual mills do little consumer advertising. The trade associations advertise in building and architectural

journals and popular magazines. They also distribute pamphlets and leaflets promoting lumber use. From the point of view of the individual manufacturer, large-scale consumer advertising by one company would not pay off, as any beneficial effect would be shared by competitors. This situation puts the industry at some disadvantage by comparison with the manufacturers of other products, many of which are produced by large companies than can afford large expenditures on promotional work.

Trade associations

The lumber industry is represented by various regional associations. The Canadian Lumbermen's Association represents manufacturers, wholesalers and retailers in eastern Canada. Within this association there are several bureaus representing particular segments of the industry. In addition, there are associations representing specific regions: for example, the British Columbia Lumber Manufacturers Association, representing the industry on the coast of British Columbia; the Northern Interior Lumbermen's Association for the Prince George area of British Columbia; the Maritime Lumber Bureau for the Maritime Provinces; the Quebec Lumber Manufacturers Association and others. The lumber industry has not given as strong support to association work as some other industries, and it is understood that only about half of production in eastern Canada has representation in association activities.

3. Consumption of Lumber in Canada

Lumber is one of the most important industrial materials used in Canada, and it serves for a great many different purposes. Its uses are well known, and one immediately thinks of its great use in construction. It has been estimated that lumber accounts for about 25% of the total value of building materials used in Canada.⁶ In addition, it is used in packaging and shipping and for a wide variety of manufactured products such as furniture, toys, fixtures and handles.

There can be little doubt that an abundant supply of lumber in the past contributed in an important degree to the growth of the Canadian economy. All of our houses contain lumber, and most are of wood-frame construction. Barns and farm buildings, warehouses, factories and stores were all built of lumber. Abundant and low-cost supplies of lumber contributed, for instance, to the rapid development of the Prairie Provinces.

Canada is the world's heaviest per capita consumer of lumber. Data reported by the Food and Agriculture Organization of the United Nations showing per capita consumption of lumber for several countries are given in Table 12.

⁶Based on weights used for price indexes by the Dominion Bureau of Statistics.

Table 12

AVERAGE PER CAPITA CONSUMPTION OF LUMBER, 1949-53

	Board feet
Canada	284
New Zealand	278
United States	250
Norway	212
Australia	174
Sweden	153
Russia	131
Denmark	123
Finland	102
Switzerland	98
West Germany	76
United Kingdom	68
Japan	68

a Converted from cubic metres.

SOURCE: *Yearbook of Forest Products Statistics*, F.A.O., Rome, Italy, 1954, p. 116.

One reason for the heavy consumption in Canada is the abundance of high-quality timber of sawlog size and the relatively low cost of lumber by comparison with other industrial materials. In countries which have to import lumber, its price will be relatively higher than in Canada, and other materials, produced locally in many cases, will be used instead.

Consumption by major uses

Direct estimates of total lumber consumption by end uses in Canada have never been made, according to the Commission's investigations. The Dominion Bureau of Statistics has collected data on lumber consumption by certain manufacturing industries, but the information is not complete. Furthermore, direct estimates of lumber consumption in construction are lacking. It is not possible, therefore, to estimate future Canadian consumption by major end uses.

An attempt was made, however, to estimate consumption by industries for the years 1950 to 1953, and the results are given in Table 13. These are only rough estimates, and some of the data may be considerably erroneous; but it is thought worthwhile to give an indication of the relative importance of different end uses.

Construction is certainly the largest single use of lumber, and residential construction probably accounts for most of the lumber used for this purpose. Wood manufacturing industries also account for a large percentage of consumption. Some of the lumber consumed by the wood manufacturing industries ends up in housing and other construction in the form of doors, windows and similar items, but the volume of lumber in this category is not known.

Shipping provides another important outlet for lumber, but it is not possible to show the total amount of lumber used for this purpose. The volume of lumber in box shooks is shown in the table; but the volume in

Table 13

LUMBER CONSUMPTION IN CANADA BY MAJOR USES
(millions of board feet)

	1950	1951	1952	1953
Residential construction ^a	916	835	750	965
Railway ties.....	246	242	433	349
Box shooks.....	99	100	92	85
Wood manufacturing industries.....	763	815	766	872
Other manufacturing industries ^b	168	206	143	166
Sub-total.....	2,192	2,198	2,184	2,437
Total apparent lumber consumption in Canada ^c ..	3,061	3,642	3,620	4,088
Difference unaccounted for.....	869	1,444	1,436	1,651

a Not including doors, windows, cabinets and other millwork items.

b Includes a small quantity of logs and bolts sawn by industries other than the lumber industry.

c Production minus exports plus imports.

SOURCE: Dominion Bureau of Statistics.

finished boxes is not known, nor is the quantity used for crating and Dunnage. It is quite likely that a large percentage of the lumber used by "other manufacturing industries" goes into crating. Railway ties constitute another important use, the estimates for which are based on purchases of ties by steam and electric railways, as reported to the Dominion Bureau of Statistics. The data do not include ties used by industrial and mining railways.

The quantity of lumber unaccounted for was larger for three of the years than the quantity devoted to any single purpose. This lumber would be used for non-residential building construction, engineering construction, shipping, mining, repair and maintenance, farm building and other purposes.

The lack of accurate data on the use of lumber today and trends in its use over a period of time put a serious handicap in the way of making realistic estimates of future markets.

The trends of lumber consumption

There has been an upward trend in the consumption of lumber in Canada since 1920, as shown in Figure 6. The heavy use in the late 1920's corresponded to a period of active housebuilding in Canada and high general prosperity. There was a marked drop during the depression of the 1930's so that the level of consumption in 1933 was less than one-third the level of 1929. A general rise in consumption through the 1930's was followed by a slight falling-off during World War II. This was probably caused not by reduced demand or need for lumber, but by short supply and the shipment of large quantities overseas.

Consumption rose rapidly after the war. The year 1946 saw a higher level of consumption than the peak year of the 1920's, and consumption has remained at a high level since, again stimulated by a large volume of house-building.

APPARENT CONSUMPTION OF LUMBER IN CANADA 1920-54

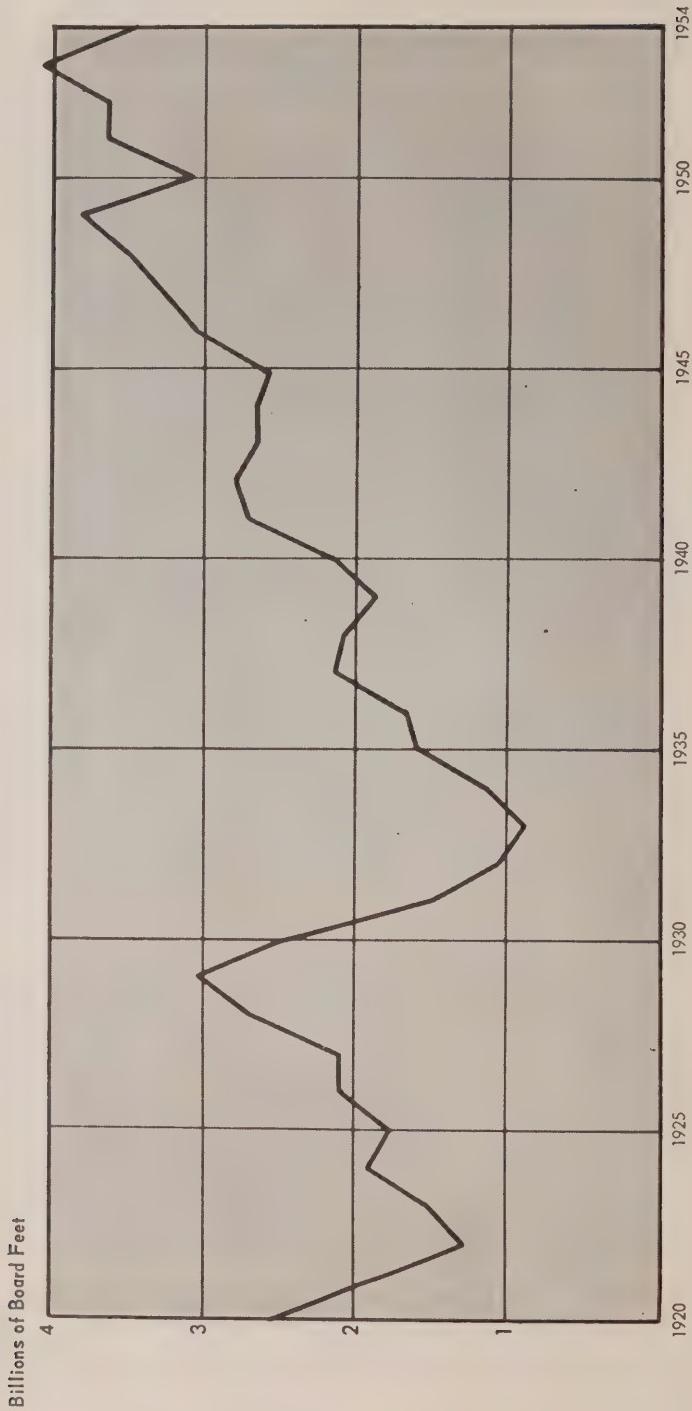


Figure 6

With regard to per capita consumption of lumber, there has been no definite upward or downward trend since 1920. It is true that per capita consumption in 1929 was higher than in any later year during the period but one year cannot be taken as significant.⁷ Average annual per capita consumption was 252 board feet during the years 1926 to 1930, and 248 board feet during the period 1950 to 1954. This small change does not suggest any strong long-term trend in per capita consumption.

In this regard it is interesting to compare per capita consumption in Canada and the United States, as shown in Figure 7. Lumber has played similar roles in the economics of the two countries, both of which have used lumber lavishly. Per capita consumption in the United States has shown a downward trend since the decade of the 1920's. A comparison of United States per capita consumption for the two periods just referred to in connection with Canada shows that consumption averaged 294 board feet from 1926 to 1930, and 254 board feet from 1950 to 1954. This represents a decrease of 14%.

PER CAPITA CONSUMPTION OF LUMBER, CANADA AND UNITED STATES, 1900-54

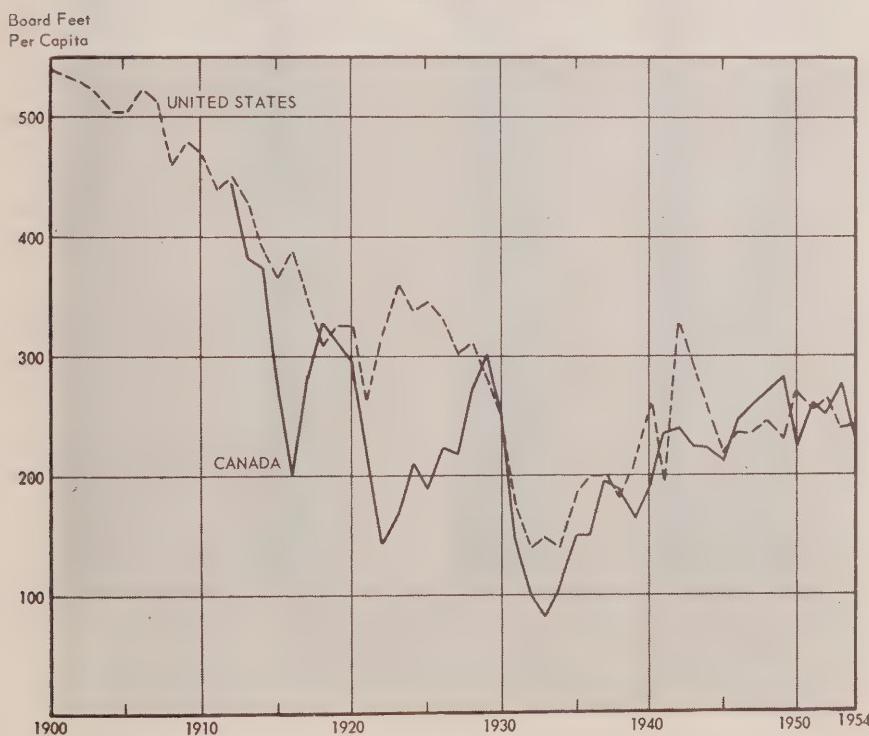


Figure 7

⁷Consumption figures are "apparent consumption"; that is, production plus imports minus exports. A high figure for any one year may thus reflect accumulation of stocks.

LUMBER CONSUMPTION IN CANADA COMPARED WITH ECONOMIC INDICATORS

1947 - 49 = 100

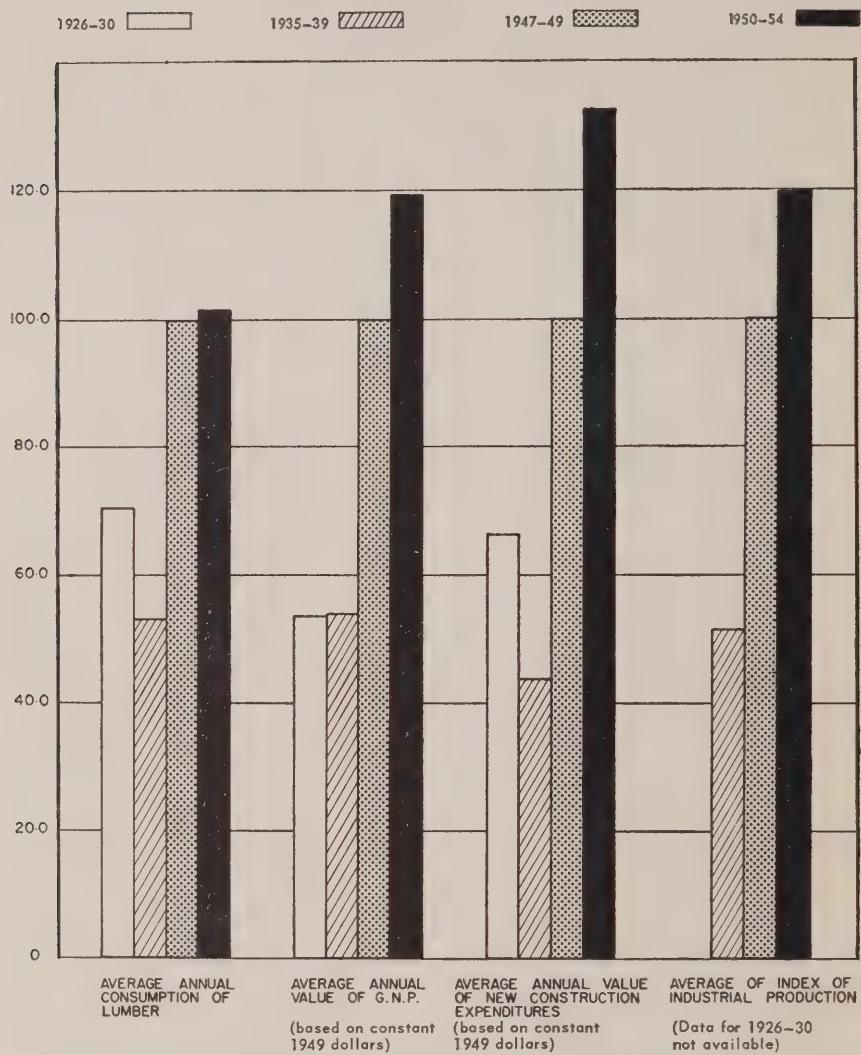


Figure 8

CONSUMPTION OF BUILDING MATERIALS IN CANADA

1947-49 = 100

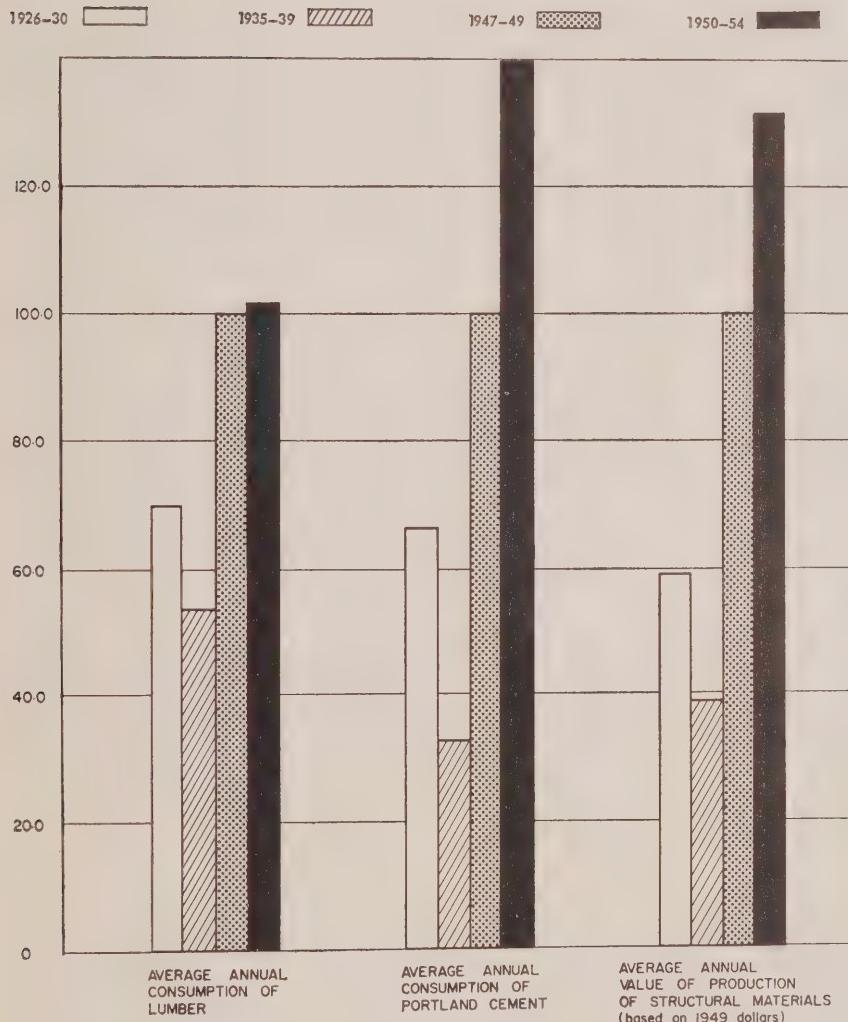


Figure 9

Lumber consumption and the level of economic activity

Despite the rising total consumption of lumber, it has not kept pace with the general rise in economic activity in Canada. This may be seen by comparing consumption with Gross National Product, construction expenditures and industrial production over the period. These indicators are shown graphically for four different periods in Figure 8.

For the period 1950 to 1954, Gross National Product in constant dollars was 2.2 times, new construction expenditure in constant dollars twice, and lumber consumption 1.4 times the level of the period 1926 to 1930. A comparison of the period 1950 to 1954 with the period 1935 to 1939 shows that Gross National Product in constant dollars was 2.2 times, construction expenditure three times, the index of industrial production 2.3 times, and lumber consumption 1.9 times the earlier level. It appears, therefore, that lumber today plays a relatively less important role in the economy than it did 20 or 30 years ago.

If the consumption of lumber is compared with the consumption of other building materials, it appears to have lost ground, as indicated in Figure 9. Consumption of other structural materials has risen more than lumber consumption since 1920. In the years 1950 to 1954, the average annual consumption of cement was 2.1 times the average consumption from 1926 to 1930; for the same periods production of structural materials⁸ was 2.2 times and consumption of lumber 1.4 times the earlier level. Consumption of cement in 1950 to 1954 was 4.3 times, production of structural materials 3.4 times and consumption of lumber 1.9 times the average consumption during the years 1935 to 1939.

In interpreting these comparisons it must be remembered that lumber is a long-established and widely used commodity. As such it will appear to lose ground in relation to other, newer materials as they are introduced, even though it remains a very important construction material and its over-all use is expanding. Also, changes in types of construction activity—to more road and engineering construction, for instance—could cause increases in the use of other materials without displacing lumber.

Developments affecting the consumption of lumber

Since lumber consumption has not kept pace with the growth of the Canadian economy nor with the consumption of other materials, it would appear that it has been replaced in some uses by other materials. The lack of data on consumption by uses precludes a detailed analysis of consumption trends, so that it is not possible to estimate which markets for lumber have declined, which markets have held steady and which have grown. However,

⁸Structural materials include cement, sand, gravel, brick, tile, and stone. Volume of production is measured by value of production in 1949 dollars. Data on consumption of all of these materials was not readily available. Since exports and imports have not been large relative to production, it is believed that production figures reflect consumption fairly closely.

certain past trends affecting lumber consumption are well known, and it may be worthwhile to consider past developments so as to obtain a general idea of the major forces that have been operative. Recent studies of the demand for lumber in the United States provide information on market conditions in that country, where there are many similarities with developments in Canada.⁹

Casual observation will reveal that many developments have caused this reduction in the relative use of lumber. Technological developments have been important. Changes in the types of buildings constructed in recent years (larger stores in place of the corner grocery) may require steel where formerly lumber was used. New materials such as plywood and building boards have been developed. Cost-saving building techniques have favoured other materials. The trend toward urbanization has meant more buildings of fire-resistant construction, for which wood is not generally approved. Also, the price of lumber has risen in recent years much more than the price of competing materials.

(i) *Lumber prices*

Lumber prices have risen markedly during the past 30 years. For instance, in 1929 the average value of lumber produced in Canada was \$23.90 a thousand board feet. The average value in 1951 was \$73.06 (lumber prices have dropped somewhat since that year). The wholesale price index for lumber, with 1949 equal to 100, rose from 33.9 in 1929 to 120.0 in 1954, while the general wholesale price index rose from 62.8 in 1929 to 109.4 in 1954. If the lumber index is put on a "real" basis by dividing by the general wholesale price index, it may be seen that "real" prices of lumber in recent years have been about double the level of the late 1920's. These relationships are shown in Figure 10. Although it has not been possible to measure the effects of the rise in lumber prices on consumption, there can be little doubt that it has been important.

(ii) *Consumption trends in certain uses*

In all probability the market which has shown the greatest percentage and absolute decrease in the use of lumber per unit of construction is non-residential construction. Technical factors have probably been the main cause. Trends to fire-resistant materials have eliminated wood from the main structure of many types of buildings. Lumber is still fairly widely used as framework in commercial and industrial structures in smaller centres, one of the reasons being that it can often be produced locally whereas steel may have to be brought in from a distant source of supply.

⁹America's Demand for Wood, 1929-1975 (Stanford Research Institute), Weyerhaeuser Timber Company, Tacoma, Wash., 1954; Timber Resource Review (preliminary draft), United States Forest Service, Washington, September 1955.

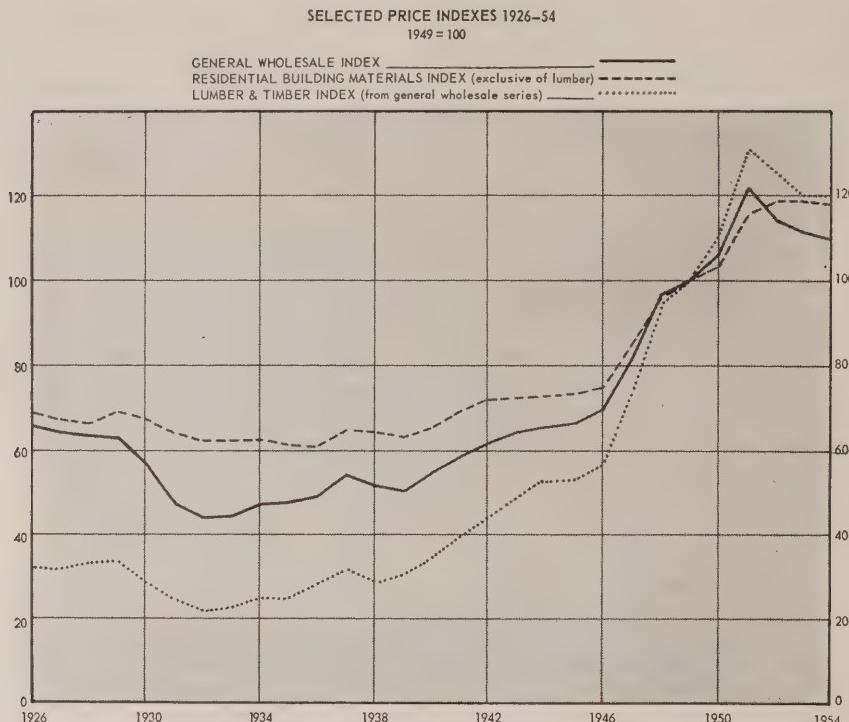


Figure 10

Much of the lumber used for non-residential construction today is of a temporary nature and does not form a part of the finished building—concrete forms, scaffolding, etc. Part of this market has also been lost. Plywood is being used for concrete forms and temporary sheds and buildings, and steel has taken over part of the scaffolding.

In residential construction, there is probably less lumber used per house today than was formerly the case. It has been estimated that in the United States the average lumber content per dwelling unit constructed was 14,200 board feet during the period 1920 to 1929 and 10 thousand board feet in 1952.¹⁰

No such estimates are available for Canada, but a similar trend has probably occurred. There has probably been some reduction in the average size of house built since the 1920's. On the other hand, it appears that a trend has developed toward the building of single houses in Canada. In the early 1920's the proportion of single houses to total dwellings completed varied between 50% and 75%; in the late 1930's the proportion was about 50%; since 1950 the proportion has ranged from 68% to 75%. Single houses gener-

ally require considerably more lumber per unit than multiple houses, but within the house, the trend to lower ceilings has meant less lumber consumption for a given floor area. Also, architectural changes such as lower-pitched roofs and the elimination of large porches have reduced lumber consumption per house.

Substitution of other materials for lumber has occurred in residential construction, but it is thought that up to now this has been relatively unimportant in affecting lumber consumption. Metal windows, steel beams and posts, and concrete steps have come into use, but the percentage of total lumber in such items is small. Recently there has been a trend toward the use of other materials in place of lumber in more important items—plywood for sub-flooring and plywood and fibreboard for sheathing. Wood flooring has been replaced by tile to some extent. Such trends may be more important in the future than they have been up to now.

In shipping and packing the reduction in the use of lumber relative to the quantity of goods transported has been due to some extent to the greater use of truck transport, which does not require as much crating and dunnage material as rail transport. Great inroads have been made into the box market by corrugated containers, which save weight and provide economies in setting up, packing and labelling. Wooden barrels have been replaced to a large extent by steel and fibre drums and multiwall paper sacks.

In manufacturing, many items formerly made of wood are now made of metal or plastic. Technological developments in new materials and new methods of mass production have meant the displacement of lumber in manufactured products.

Future Canadian demand for lumber

In considering future Canadian demand for lumber it must be recognized that factors important in the past may be expected also to affect future trends. It is worthwhile, therefore, to summarize the major forces affecting past trends and the important characteristics of lumber as an economic commodity.

(i) Factors unfavourable to the use of lumber

The disadvantages of lumber and developments unfavourable to its use in recent years may be summed up as follows:

- (1) Lumber has certain technical disadvantages. It is a non-uniform product and varies widely in the properties of strength and durability from one species to another and even within species. It is subject to certain defects both of nature and of manufacture. It is not stable under conditions of changing moisture content.

- (2) Because of the non-uniformity of lumber, mass production techniques have not been applied in wood-using industries to the same extent as in other industries.
- (3) Maintenance costs of lumber used in exposed places are high by comparison with such costs for some other materials such as brick and stone.
- (4) Increasing emphasis on fire-resistant construction has led to the use of other materials in urban building.
- (5) The price of lumber has risen in relation to that of other products in recent years.
- (6) Cost-saving techniques in the building industry have led to the substitution of other products for lumber for some purposes.

(ii) Factors favourable to the use of lumber

Despite these disadvantages, lumber has many points in its favour and is efficient and economical for many uses.

- (1) Lumber is easy to work and does not require elaborate equipment.
- (2) It has good strength-for-weight properties and compares favourably with other structural materials.
- (3) In spite of the fact that wood will burn, it has the advantage of not buckling under extreme heat.
- (4) For many purposes for which it is technically suitable and for which mass production is not employed, it is the cheapest structural material.
- (5) It can be used in conjunction with mass production techniques if standardization problems can be overcome. In this regard it is of interest to note that an estimated 98% of the prefabricated houses built in the United States are of wood-frame construction.
- (6) Wood has wide aesthetic appeal and is preferred by many people over other materials.

Recent developments in improved materials and methods of gluing wood, in preservative treatment and in treatment for fire retardation have reduced some of the technical drawbacks to the use of lumber.

(iii) Future lumber prices

For the future it is assumed in this study that lumber prices will continue to rise in relation to those of other materials. This assumption is based on the expected future lumber prices in the United States given in two recent studies. The United States Forest Service has estimated that, for so-

called lower-level potential demand for lumber in the year 1975, "real" lumber prices will probably increase not less than 25% to 30% between 1952 and 1975.¹¹ This estimate also involves further substitution of other materials for lumber in the future.

The Stanford Research Institute has estimated that the price of lumber will increase more than the price of competing materials between 1952 and 1975 but that "the price of lumber between 1952 and 1975 is not expected to increase as rapidly in relation to competing materials as it has in the past".¹² While an estimate of the "real" lumber price index is not given by the Stanford Research Institute, it is thought that their estimate of future lumber prices is in fairly close agreement with that given by the United States Forest Service.

Canadian lumber prices have closely followed prices in the United States in the past and will likely do so in the future. So long as Canadian lumber can be sold in the United States, prices in the two countries will move together. Differences in prices will be the result of transportation costs and changes in the exchange rate. It is therefore assumed that by the year 1980 lumber prices in Canada will rise, in real terms, to a level about 25% to 35% above the 1952 to 1954 average. Within the period there will likely be fairly wide fluctuations in prices, as there have been in the past, and prices in any one year could be considerably below or above the trend level.

(iv) Basis of estimate of future consumption

Since it is not possible to build up detailed estimates of probable consumption of lumber by end use for the target year 1980, estimates are based on the expected level of activity of the Canadian economy and expected trends in consumption of lumber relative to other commodities.

When the level of the Canadian economy is considered, the level for the year 1980 is compared with the average of the years 1952 to 1954. It is assumed that the population in 1980 will be 26,650,000, on the basis of a net immigration of 75,000 per annum. In line with this, Gross National Expenditure is expected to be \$53 billion (1949 dollars). Non-residential building construction may be about \$3.2 billion (on the assumption that building construction expenditure will be the same percentage of Gross National Expenditure as in the period 1950-54). The number of dwellings to be constructed in 1980 is assumed to be about 185,000. This estimate is based on Central Mortgage and Housing Corporation studies estimating that 3,440,300 dwelling units will be required between 1955 and 1980. For the present study, the number of dwellings that may be constructed in 1980 has been derived by pro-rating the total number by population at 5-year intervals. These factors are summarized in Table 14.

¹¹Timber Resource Review, Chap. VI, p. 40.

¹²America's Demand for Wood, 1929-1975 (Stanford Research Institute), p. 54.

Table 14

	Population (thousands)	Gross National Expenditure ^b (billions of 1949 dollars)	Non-residential building construction (billions of 1949 dollars)	Number of dwelling units constructed (thousands)
Average,				
1952 to 1954.....	14,821 ^a	19.9	1.3	94.4
1980.....	26,650	53.0	3.2	185.0 ^c

^a July 1, 1953.^b Based on 1955 dollars, Gross National Expenditure figures would be \$26.8 billion and \$76 billion respectively.^c Computed at 186.7 and rounded to 185.

Other factors affecting the demand for lumber, such as manufacturing output and consumer expenditures, will increase in line with Gross National Expenditure. From the foregoing, Gross National Expenditure in 1980 will be 2.7 times, non-residential building construction 2.5 times, and the number of dwellings built twice the 1952-54 average. Basically, there are strong forces pointing to increased total consumption of lumber in the future.

Lumber consumption, however, is not expected to increase in proportion to total economic activity. Consumption of materials in general is not expected to rise as rapidly as Gross National Expenditure. Because of past trends, expected price increases and the other factors already mentioned, lumber is likely to be replaced to some extent in the future. There is reason to believe that it may be replaced to a greater extent in housing construction than it has been up to now. Rapid development of plywood in recent years for sheathing and structural (as opposed to decorative) use and the expected continuation of this development, together with new methods of using fibre-boards for sheathing and manufacturing purposes, are resulting in further replacement of lumber. Further inroads may be made in non-residential construction as well as in manufacturing and packaging. These changes, of course, are too recent to show a trend in consumption data. On the other hand, it is quite possible that developments could occur which would increase the relative consumption of lumber. If, for instance, a paint were developed that would make the maintenance costs of wood siding as low as the maintenance costs of brick and stone, it is conceivable that wood siding would be more widely used for housing in eastern Canada. Treatment that could make wood more stable could regain for it some of the markets for fittings, such as windows and screen doors. A trend toward single detached dwellings in place of multiple dwellings would mean more lumber per dwelling unit. In 1954, 23% of the dwellings completed in Canada were apartments.¹³ In the future this percentage could quite conceivably be reduced.

¹³There has been an upward trend in the percentage of apartments since 1950. Percentages for each year are as follows: 1950, 14.4; 1951, 15.7; 1952, 16; 1953, 20.5; 1954, 22.6. Source: *Canadian Housing Statistics*, Central Mortgage and Housing Corporation.

Present developments in laminated wood beams and arches for structural use also could increase the relative use of lumber. Developments along these lines, however, depend to some extent on consumer taste and preference, which is difficult to predict.

Because of the lack of detailed information on lumber consumption and conflicting trends in its use, it is most difficult to arrive at a realistic estimate of future consumption. A projection of the past relationship of consumption to Gross National Expenditure (on a ratio scale) suggests that consumption in 1980 will be about 6 billion board feet. A similar projection built on construction expenditures suggests that consumption in 1980 will be in the neighbourhood of 5.4 billion board feet.

In any consideration of the possible trend of per capita consumption, it will be recalled that this showed little change between the late 1920's and the 1950's. However, because of the recent trends in residential construction already noted, it is quite likely that per capita consumption will drop in the future. If it drops to 220 board feet from the recent average of 252 board feet, total consumption, on the assumption of a population of 26.6 million, would be 5.8 billion board feet. Thus it seems that lumber consumption in Canada by 1980 may be between 5.5 and 6 billion board feet. For this study, it is assumed that consumption will be 5.8 billion board feet. This compares with an average annual consumption of 3.7 billion board feet for the years 1952 to 1954, so that should the assumed level occur, lumber consumption in 1980 would be about 1.6 times the average of 1952 to 1954.

In addition to the lumber consumed in Canada, an average of 81 million board feet of logs and bolts was used by wood-using industries for the years 1951-53. It has been assumed that consumption by these industries will be 120 million board feet by 1980.

4. Export Markets for Canadian Lumber

As noted in the introductory section of this chapter, export markets have taken about one-half of Canadian lumber production in recent years. It was also noted that lumber has been and is today shipped to a large number of countries. However, more than 90% of exports have gone to the United Kingdom and the United States. Because of this and the relative unimportance of any other importing country, only the two main markets are considered in any detail.

Background

It may be said that the Canadian lumber industry was developed for the export trade. It was a pioneer industry in eastern Canada, based on the high-quality pine timber resources of the Maritime Provinces, Ontario and Quebec. Great Britain became an important market for squared timber and deal

at the beginning of the nineteenth century, when British supplies of timber from European sources were cut off during the Napoleonic Wars. The West Indies were also an important market for Canadian lumber in the early days of the industry. Trade with the United States rose to important levels about the middle of the nineteenth century, timber for this trade being cut in Quebec and Ontario. This development occurred in part because of diminishing supplies of high-quality timber in the northern United States.

The early development of the British Columbia lumber industry during the latter part of the nineteenth century was based to a considerable extent on the export of timber and lumber to countries bordering the Pacific. However, a great impetus for this industry was given by the demand for lumber from the Prairie Provinces during the time when settlement was taking place there.

This role of the export trade continues even today. The great expansion of lumber production in the Prince George district of British Columbia during the past ten years has been based on markets in the eastern and the mid-western United States.

Today the British Columbia lumber industry is the most dependent of the various regional industries on the export market. Of total shipments from the coast region during the period 1950 to 1954, 72% was shipped to export markets.¹⁴ During the same period the coast region provided 51% of total Canadian lumber exports.

In this regard it is of interest to note the relationship between world lumber production and total lumber exports. Before the Second World War total lumber exports were about 15% of world lumber production. In 1951 total exports were 16% and in 1952, 13% of world production.¹⁵ Trade, however, is relatively more important for individual countries. Sweden exported 68% of production in 1951 and 59% in 1952, and Finland exported 80% of production in 1951 and 78% in 1952.¹⁶ The United Kingdom and the Netherlands import more than 90%, and Denmark and Belgium about 80% of the lumber used. The United States is both an exporter and an importer and in recent years has been the world's second largest importer. Imports, however, have been only about 6% of United States consumption.

The pattern of Canadian lumber exports

While it is convenient to talk of Canadian lumber exports in over-all and general terms, it must be recognized that certain regions of the country serve certain markets. The British Columbia coast industry has shipped about three-quarters of the Canadian lumber going to the United Kingdom in

¹⁴Annual Report, 1954, British Columbia Lumber Manufacturers Association.

¹⁵Excluding Russia. (*Yearbook of Forest Products Statistics*, F.A.O.).

¹⁶Production data for Sweden and Finland do not include production of small sawmills. (*Yearbook of Forest Products Statistics*, F.A.O.).

recent years. Although thus dominated by British Columbia, the United Kingdom trade is important also for the lumber industry of the Maritimes and Quebec. Douglas fir has ranked first among the species shipped to the United Kingdom, and Douglas fir and western hemlock together made up 80% of shipments to the United Kingdom for the years 1950 to 1954.

For the United States market, spruce is the most important species, having made up about 40% of total shipments in recent years. Douglas fir and western hemlock from the British Columbia coast region taken together have made up another 40%, and the remainder has consisted of cedar, pine, other softwoods, and hardwoods. All important producing areas ship lumber to the United States. For some areas, such as the interior of British Columbia and Alberta, the United States is the only export market. It is also of interest to note that the United States has taken 90% of the cedar lumber exported from Canada during the past few years.

The British Columbia coast industry, which dominates in shipments to countries other than the United Kingdom and the United States, shipped about 90% of all the Canadian lumber sent to "other countries" in the period 1950 to 1954.

Distribution of lumber exports classified by main species and markets is shown in Table 15.

Table 15

CANADIAN LUMBER EXPORTS BY SPECIES

*Annual average, 1950-54
(millions of board feet)*

	United Kingdom	United States	Other countries	Total exports
Douglas fir ^a	334	720	230	1,284
Hemlock.....	229	318	30	577
Cedar.....	6	202	12	220
Spruce.....	95	1,002	34	1,131
Hardwood ^b	9	130	1	140
Total ^c	701	2,539	317	3,557

a Includes squared timber.

b Includes squared timber and flooring.

c Includes other species not shown separately.

The lumber trade since 1920

Important changes have taken place in the Canadian and world lumber trade picture since 1920. A brief review of these changes is given here as background for a study of future trade.

(i) Main developments

The two most significant points are that the United States has changed from a net exporter of lumber to a net importer and that she has replaced

the United Kingdom as the world's leading importer of softwood lumber. From 1950 to 1954 average annual imports of softwood by the United States were 2,607 million board feet, and average imports by the United Kingdom were 2,509 million board feet. This trend is illustrated in Figure 11.

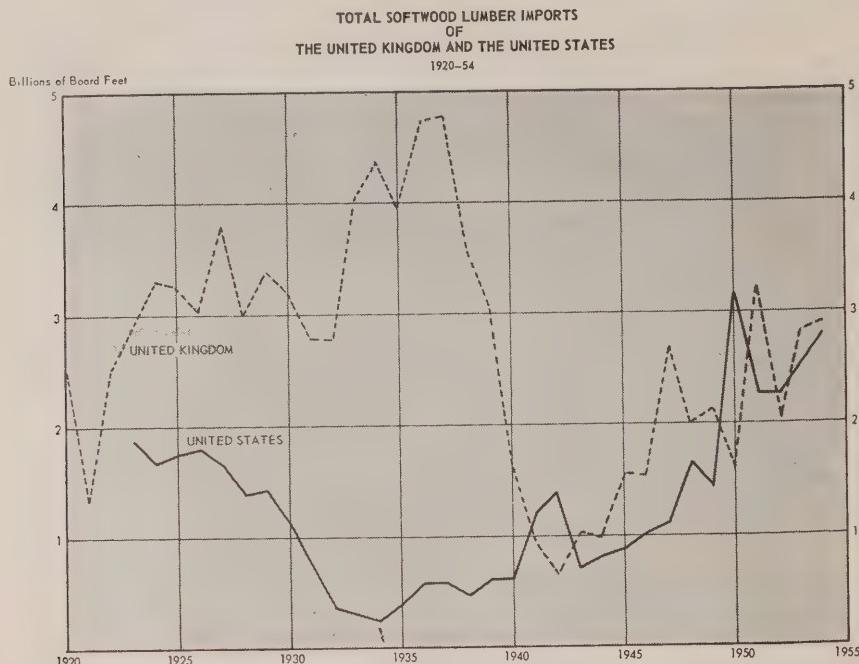


Figure 11

Along with this development there have been important shifts in Canadian trade. In the 1920's the United States was the main market for Canadian lumber. After 1932, trade shifted to the United Kingdom, which remained the most important market up to World War II. Since the end of the war, exports to the United States have increased greatly while exports to the United Kingdom have remained below the level of the late 1930's. Figure 12 shows lumber exports to the United Kingdom and the United States between 1926 and 1955.

In the European lumber trade, Russia changed from being a relatively unimportant exporter in the early 1920's and became the most important European exporter of softwood lumber from 1930 to 1937. From 1928 to 1932, Russia was the leading supplier of lumber to the United Kingdom, shipping as much as 40% of United Kingdom lumber imports in 1931. Exports from Russia were very small immediately after World War II but have risen in the last five years. So far, however, shipments to Britain have not gone above one-third of the high levels of the early 1930's.

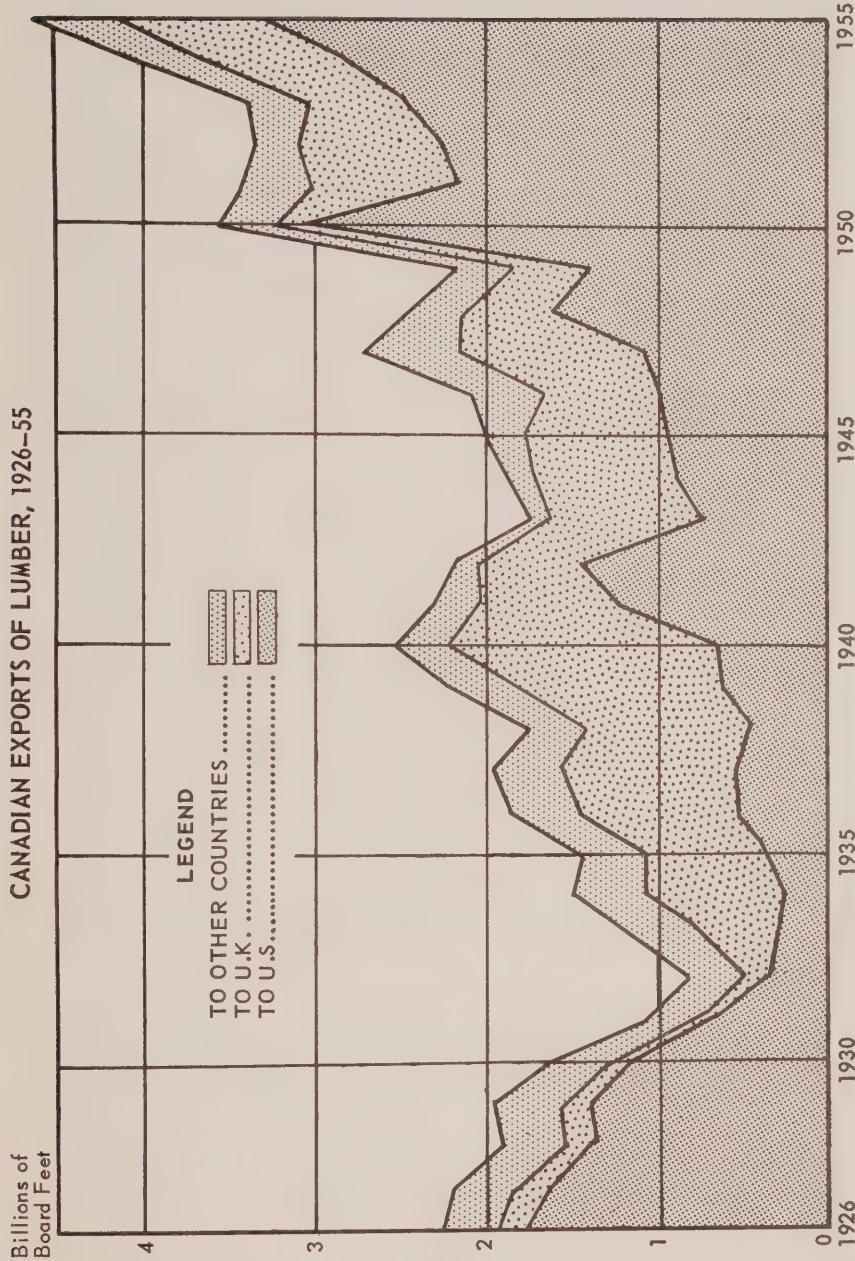


Figure 12

The British Columbia lumber industry shipped important amounts of lumber to Asian markets (China and Japan) in the late 1920's and 1930's but in the past few years there have been no shipments to China and only insignificant shipments to Japan.

(ii) *Explanation of main trends*

Canadian lumber trade was concentrated in the United States market during the decade of the 1920's. Only relatively small quantities were shipped to Great Britain, and Canada supplied only a small percentage of that country's imports. To all intents and purposes the British Columbia industry was not in the United Kingdom market, despite a certain amount of promotional work that had been done. Most of the Canadian lumber shipped to the United Kingdom came from eastern Canada.

An almost complete reversal of this situation occurred after 1932. In the first place the market for lumber in the United States became greatly depressed. Consumption of lumber in that country dropped from 38 billion board feet in 1928 to 17 billion in 1932. Lumber prices dropped by about 40%. The tariff act of 1930 imposed a tariff of \$1 per thousand board feet on most softwood (except rough lumber), and in 1932 an import tax of \$3 per thousand board feet on all lumber was added. Under these conditions it became unprofitable to ship lumber to the United States. Canadian lumber exports across the border dropped from more than 1 billion board feet in the late 1920's to 234 million in 1934. In 1930, exports of Douglas fir and western hemlock to the United States were 492 million board feet; in 1933 they were 23 million and in 1934 they were down to 5 million board feet.

The United Kingdom market showed a different trend. Consumption did not fall to the same extent as in the United States and, in fact, after 1932 it rose to new high levels. In 1936 and 1937 United Kingdom softwood lumber imports were 55% higher than the average of the period 1925 to 1929. The lumber market was sustained by a high level of house building, the situation being just the opposite of what it was in the United States. In addition, Canadian lumber was given a 10% c.i.f. tariff preference in the United Kingdom in 1932.

The situation in the 1930's, therefore, included the following elements: a weak lumber market in the United States; a strong lumber market in Great Britain; penalties in the form of tariffs on lumber shipped to the United States; and preferential tariff treatment for Canadian lumber in the United Kingdom. Britain became Canada's main export market for lumber in 1933 and remained so until 1940; but after 1936 improved markets and a reduction in tariffs gave Canadian lumber greater opportunity in the United States, and shipments to that country rose substantially.

It is important to remember that during the 1930's Great Britain had abundant, low-cost lumber supplies. A great increase in sawmilling capacity in Finland during the 1920's, the re-entry of Russia into the lumber trade

late in that decade, a reduced demand from continental countries, and the inability of Canada to sell large quantities in the United States, were all factors contributing to the abundance available to the United Kingdom import trade. In addition, there was the housing boom of the mid 1930's. These circumstances kept United Kingdom lumber imports at record levels from 1934 to 1937.

Canada became an important source of supply for the United Kingdom during the period. She provided about 20% of the total imports during the late 1930's, and was the only large source of supply for Britain during World War II.

After the war another reversal occurred. Canadian exports to the United States have increased to nearly five times the prewar level. A high level of economic activity, including residential construction, has meant strong markets and rising consumption of lumber. Increased lumber prices and a lowering of the tariff have meant better opportunities for the sale of Canadian lumber in the United States. Although exports to the United Kingdom have remained high, total United Kingdom imports from all sources have been below prewar levels. For the period 1950 to 1954, United Kingdom softwood imports averaged 2,509 million board feet a year instead of the 3,439 million board feet averaged from 1930 to 1934 and the 4,025 million board feet averaged from 1935 to 1939. The reasons for the United Kingdom's import reduction are reduced supplies and increased lumber prices. Russia has been exporting only about one-quarter of the amounts shipped in the early 1930's. Finland also has been shipping less than in the prewar period, partly because of the loss of Karelia, an important lumber-producing area. Also, other formerly important exporting countries, such as the Baltic States and Poland, have disappeared from the trade. The magnitude of this change may be realized if it is noted that in 1936 the combined softwood lumber exports of Russia, Estonia, Latvia, Lithuania, Poland, Czechoslovakia and Rumania totalled 4,073 million board feet. The Food and Agriculture Organization of the United Nations has estimated that total Russian lumber exports in 1952 and 1953 were 261 million and 598 million board feet respectively.

Lumber prices in the United Kingdom since 1951 have been about six times the prices of the immediate prewar period. The general wholesale price index (1948=100) rose from 41 in 1935 to 150 in 1952, whereas the average value of lumber imports on the same index basis rose from 19 to 158. Thus in "real" terms, the price of lumber rose from 46 in 1935 to 105 in 1952, or more than double. This changed situation for lumber in the British economy must be considered in any consideration of future markets.

The prospects for exports in the future

In regard to possible levels of exports in the future, markets and demand from foreign countries are, of course, of prime importance, although past and

present export levels are a result not only of market situations, but also of Canadian supply and production. In reality, however, the world lumber-market situation determines Canada's export possibilities, and the supply of lumber to world markets from Sweden, Finland, Russia and other exporting countries is as important as demand in the importing countries.

It is impossible to consider all of these factors, so that simplifying procedures must be used. This section is nevertheless based on the following simplified question: *With our knowledge of export markets, based on present and past levels of export, what will future market developments in the United Kingdom and the United States imply for future exports?* The supply to these markets from other sources is also considered. This procedure provides an estimate of what Canada might expect to export. Whether or not this estimate will prove realistic depends on the Canadian supply of lumber, which is discussed in the next section.

(i) Prospects for exports to the United States

This section is based on reports by the Stanford Research Institute and the United States Forest Service, which have already been referred to.

Briefly, exports of lumber to the United States in 1954 were more than four times as large as in 1939. This occurred with a high level of industrial activity in the United States, high levels of construction, and increased consumption of lumber. Also in recent years, the United States lumber industry has not been able to supply at prewar price levels the quantities of lumber that its economy could consume.

For the future, further expansion of the United States economy is expected. Estimates for the United States economy of 1975, published by the United States Forest Service, show the expected Gross National Product to be 75% higher than in 1952, new non-residential construction to be two-thirds higher than in 1954 and new dwelling units built to be almost double the number constructed in recent years.¹⁷ Thus the basic factors affecting the demand for lumber will increase.

On the other hand, there is the ability of the United States lumber industry to increase production. The nature and volume of timber in the United States available to the lumber industry does not appear to be such that output can be increased in the future at present prices. The Stanford Report gives four reasons for this:

- (1) The cost of stumpage is likely to keep increasing as the supply of available and readily accessible timber is reduced.
- (2) Logging costs are likely to rise as logging activity continues to shift to relatively remote areas or regions with rugged terrain.

- (3) Manufacturing costs will probably be increased by the declining size of logs, rising labour costs and an increased proportion of output from small, relatively high-cost mills.
- (4) Distribution costs, which represent about two-thirds of the cost of lumber to the consumer, will probably also increase.¹⁸

The *Timber Resource Review* does not discuss manufacturing costs and supply price in detail but does state that timber quality is on the down-grade.¹⁹

Both studies suggest that lumber will be replaced by other materials for certain uses in the future and that its use will not increase in proportion to general economic activity nor to the use of certain other materials. For instance the Stanford Research Institute estimates 8,700 board feet of lumber will be used per dwelling unit in 1975, compared with 10,500 board feet in 1953. Less lumber per dollar's worth of non-residential construction and per dollar's worth of furniture manufactured is estimated by both reports. The Stanford Research Institute estimates that there will be a decrease in the total amount of lumber used in non-residential construction, while the Forest Service estimates that there will be an increase. The Forest Service expects a decrease in the total amount of lumber used in shipping, but the Stanford Research Institute expects an increase.

The final result of factors affecting lumber demand and supply in the United States economy is a modest increase in lumber consumption and an increase in real lumber prices in the neighbourhood of 25% to 30%.²⁰ Consumption in 1975 is estimated by the Stanford Research Institute to be 44.6 billion board feet, compared with 40.7 billion board feet in 1952, and by the Forest Service to be 48 billion, compared with 41.5 billion board feet in 1952.

The important factors in future Canadian exports of lumber to the United States will be, in general, an increased demand for lumber and rising prices. That country will not, apparently, be able to produce as much lumber as consumers would take if prices remain at current levels. This suggests increased opportunities for exports to that market. It would not appear likely that tariffs will be increased in the lumber supply situation that is expected to exist.

Both of the studies quoted refer briefly to the prospects for imports of lumber into the United States in the future. The Stanford Research Institute estimates imports of 4.3 billion board feet in 1975, compared with 2.5 billion board feet in 1952.²¹ The report further states that "imports of timber

¹⁸*America's Demand for Wood* (Stanford Research Institute), p. 22.

¹⁹*Timber Resource Review*, Chap. I, p. 52, and Chap. VII, p. 15.

²⁰Price has already been examined.

²¹*America's Demand for Wood* (Stanford Research Institute), p. 233.

and timber products to the United States during the period of this study will be largely from Canada and Alaska" and that "it would appear likely that a major portion of our future imports will be from that country (Canada) and probably largely from British Columbia".

The United States Forest Service estimates net imports in 1975 to be 1 billion board feet, compared with 1.7 billion board feet in 1952. The report says: "These estimates of future net imports are, of course, a matter of judgment. It is possible that they could be larger, but in view of the prospective needs for softwood lumber in the under-developed parts of the Free World and the limited supply of it outside the Soviet sphere, it appears safer not to count on any increase of imports into the United States."²²

The United States has had to draw increasingly on Canadian sources in recent years for its lumber supplies. Because of the factors already mentioned, it seems likely that this trend will continue. The market for Canadian lumber in the United States should be strong and provide opportunities for greater sales than at present. Canada supplied 2% of total lumber consumed in the United States in the year 1937 to 1939. From 1952 to 1954 Canada supplied 6% of United States consumption. It seems not unlikely that Canada may supply an increased percentage in the future, even as much as 10%.

The Stanford Research Institute estimates that lumber consumption in the United States in 1975 will be 44.6 billion board feet, and the Forest Service estimates that it will be 48 billion board feet. By 1980, consumption will likely be greater by about 1 billion board feet.²³ Hence, if the Stanford estimate for 1975 is accepted, consumption in 1980 may be reckoned at 45.6 billion board feet, whereas on the basis of the Forest Service estimate, the 1980 consumption figure may be taken to be 49 billion board feet.

If Canada should supply 10% of United States consumption, exports of lumber to that country could be between 4.5 and 5 billion board feet by the year 1980.²⁴

(ii) Prospects for exports to the United Kingdom

Average annual imports of softwood lumber by the United Kingdom during the 5-year period 1950 to 1954 were 2,509 million board feet. In the 5-year period preceding World War II, imports averaged 4,025 million board feet. Thus the recent average has been about 60% of the pre-war level.

²²*Timber Resource Review*, Chap. VI, p. 50.

²³On a straight line basis, the increase in consumption of "new" lumber estimated by the Forest Service between 1952 and 1975 is 986 million board feet per 5-year period. On the same basis, the increase in consumption of lumber between 1975 and 2000 estimated by Stanford is 927 million board feet per 5-year period.

²⁴In this connection the Stanford Research Institute expects the increase in United States imports to occur after 1965 and actually predicts a decrease in imports in the period up to 1965. Expected imports in 1965 are 1.5 billion board feet, compared with 2.5 billion board feet in 1952. *America's Demand for Wood*, p. 233.

As already noted, lumber was replaced in certain uses during World War II, when lumber was in very short supply in Great Britain. Up to the present, it has gradually but only partially regained its place.

For the future, the general level of economic activity may be expected to increase so that the basic forces affecting the demand for lumber should be more in evidence. Prices of lumber are expected to be above recent levels, or about in line with the increase assumed for North America. This will have a tendency to restrain increases in consumption. On the other hand, it would seem a distinct possibility that lumber could find greater use in construction, in accordance with its former place in this industry. Lumber has already experienced displacement in the United Kingdom and some recovery of its position would seem likely, in contrast to expected trends in North America.

If British imports of lumber increase in the future, imports from Canada will probably increase too. The main source of British lumber is northern Europe. These countries also supply large quantities of lumber to other western European countries. An expanding economy in Europe will mean increasing demands for lumber from the northern European exporting countries. The lumber industry of northern Europe is at an advanced stage of development in relation to the sawtimber resources of the area. There are no large unexploited areas yet to be opened up. While increases in lumber production in this area can be expected, such increases will be gradual and will be based on improved yields and more efficient production rather than on the bringing of new resources into use. Thus it would seem unlikely that northern Europe could supply the total increase in western European lumber imports that may be expected in an expanding economy.

It seems likely, therefore, that United Kingdom imports of lumber will increase in the future. The increase will probably occur gradually, corresponding approximately to the increase in total economic activity. It is assumed that, by 1980, imports of softwood lumber will have regained the prewar level of 4 billion board feet. Canada has supplied 26% of United Kingdom lumber imports during the past five years. In accordance with the reasons already given, Canada should be able to maintain this percentage, so that exports of lumber from Canada to the United Kingdom may be expected to amount to 1 billion board feet by 1980. This compares with average annual exports of 0.8 billion board feet during the period 1952 to 1954.

It should be noted that in the postwar period British imports of lumber from Canada have been quite variable from year to year. This situation could continue so that imports in any one year could be considerably below or above the average level. Also, a possible increase in exports from Russia could change the expected pattern. As of now, there is no reason to believe that exports from that region are likely to reach the high prewar levels.

(iii) *Prospects for exports to other countries*

During the past 25 years Canada has been exporting between 200 million and 400 million board feet of lumber annually to countries other than the United States and the United Kingdom. It is impossible to give any detailed analysis to this market. In general, however, it may be reasonably assumed that these countries will continue to demand lumber, and Canada should be able to maintain her position. It is therefore taken for granted that exports to other countries in 1980 could be expected to be about equal to average annual exports, during the period 1950 to 1954, of 318 million board feet or, say, 300 million board feet. Should the foreign trade situation become freer, it is possible that lumber exports to these countries could be considerably greater.

The three foregoing estimates are summarized in Table 16.

Table 16

ESTIMATED CANADIAN LUMBER EXPORTS

(millions of board feet)

	Average, actual 1952-54	Estimated 1980
To the United States.....	2,500	4,500-5,000
To the United Kingdom.....	776	1,000
To other countries.....	313	300
Total.....	3,589	5,800-6,300

It should be re-emphasized here that these estimates are based on what the Canadian lumber industry might be able to sell if it can meet the demand that may be made upon it. If this pattern develops, it will provide, in conjunction with expected increased lumber prices, a substantial increase in revenue.

The average value of exports for the period 1952 to 1954 was \$70.10 per thousand board feet, in 1949 dollars. A 30% increase in price would bring this value to \$91 per thousand board feet by 1980. Total revenue in 1949 dollars in 1980 would thus be \$528 million on the basis of exports of 5,800 million board feet, and \$573 million on the basis of 6,300 million board feet. This compares with average revenues of \$251 million (1949 dollars) for the period 1952-54.

The demand for lumber both in Canada and from abroad, in common with other materials used primarily in construction, has varied considerably from year to year. This has resulted in fairly marked fluctuations in prices, production and the profits of the industry. It is likely that a similar pattern will prevail in the future, so that the movement to the levels suggested by this study will not be entirely smooth and activity in the industry in any one year may show a fairly large deviation from the trend.

5. Supply and Production of Lumber in Canada

As stated in the introductory section, a study of the future of the Canadian lumber industry cannot be realistically based on market developments alone. Supply factors will be as important as markets in determining future operating levels and employment in the industry. Supply aspects—past, present and future—are discussed in this section. In a later chapter the prospective supply situation for lumber in relation to that for other forest products is discussed.

The trend of lumber production

There has been a more or less steady increase in lumber production in Canada since the early 1930's as shown in Figure 13. During the decade of the 1930's, however, production was below the level of the 1920's. A high point was reached in 1911 when lumber production totalling 4.9 billion board feet was reported. Production remained fairly steady up to 1930, varying between 3.5 and 4.7 billion board feet.²⁵ The high level of production of 1911 was not, however, reached again until 1941.

The postwar period has seen a fairly sharp and steady increase in production. The average production for the period 1952 to 1954 was 67% higher than for the period 1926 to 1930, and 89% higher than the average for the years 1936 to 1939. This increase has been in response to strong markets and increased prices.

Increased production in the postwar period has been reported by all important producing provinces. However, about 60% of the reported increase from the prewar to the postwar level has occurred in British Columbia. In terms of percentage increase, the greatest change has probably occurred in the interior region of that province. Data on production in this area are not available for the prewar period, but production in 1954 was 4.4 times the level reported for 1945.

Changes in factors affecting production

(i) *Factors affecting costs*

The substantial increases in production that have been recorded by the Canadian lumber industry have been made despite several developments adverse to expansion. A detailed analysis of such factors would require information that is not at present available. However, much can be said in a general way that will indicate the major changes that have taken place.

Over the years there has probably been a trend toward the use of lower-quality resources. This is indicated to some extent by production of different species. The preferred species for softwood lumber production in Canada

²⁵Excluding the years 1921 and 1922 when production fell because of the depression of those years.

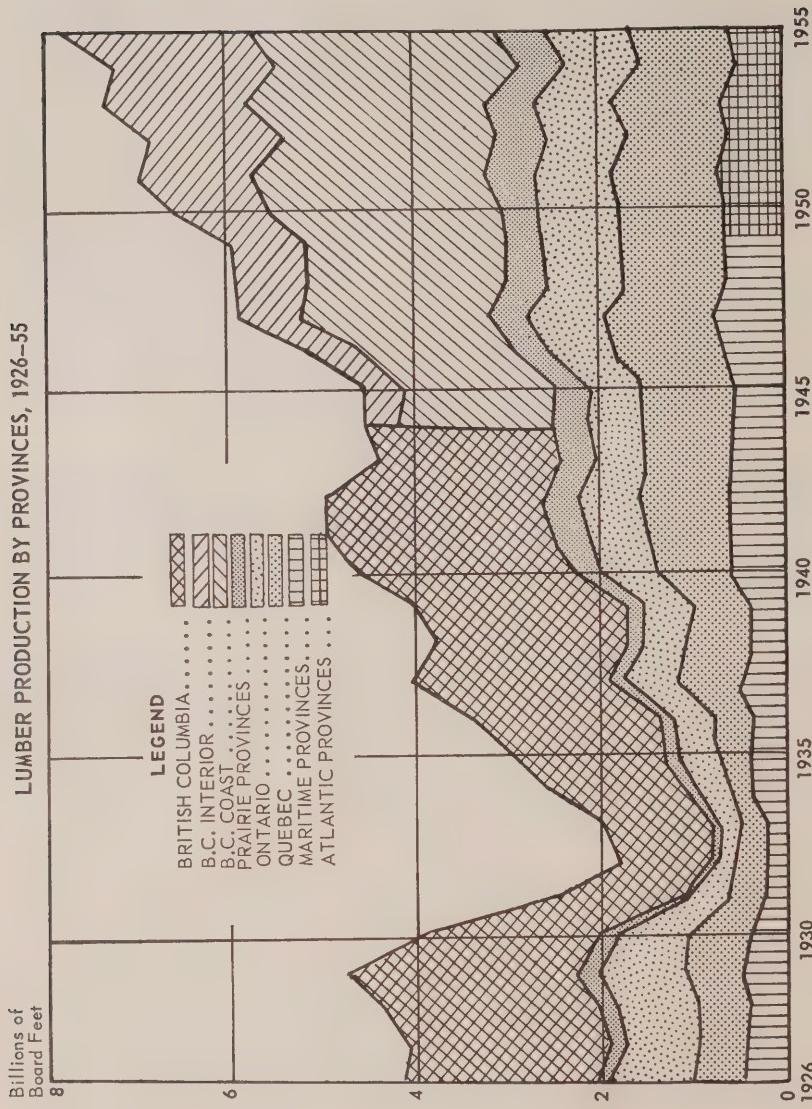


Figure 13

have been the white and red pines in the East and Douglas fir in the West. Production of these species has not shown a very large percentage increase in recent years. Most of the total increase in production between the prewar and postwar periods came from increases in spruce, balsam fir, hemlock and jack and lodgepole pines. Species such as hemlock and jack pine, which were considered inferior, have certain lower-quality characteristics by comparison with Douglas fir and the other pines.

There has probably been a reduction in the average size of logs cut and the average size of timber being cut for sawlogs. There is no detailed information on this point but it is generally agreed that this is the case. It is believed that in the coast region of British Columbia the average size of logs is now about half the prewar size. The use of smaller-sized logs generally means higher costs of manufacturing a thousand board feet of lumber and may mean a lower average value for the lumber produced.

There has probably been a decrease in the quality of the operable timber now being logged. Timber being logged today is in less dense stands, consists of smaller-sized trees, is in many cases on rougher ground and is more remote and farther from the mills than was formerly the case. This aspect has an important bearing on the profitability of the sawmill industry and directly affects the quantity of lumber that can be produced economically.

As an indication of the change that has taken place is the increase in the cost of logs, here is what the Dominion Bureau of Statistics reports for selected years in regard to the average cost, in dollars per thousand board feet of logs used by the sawmill industry: 1928, \$12.65; 1929, \$12.75; 1938, \$11.47; 1939, \$11.22; 1950, \$34.40; 1951, \$40.82; 1952, \$39.37; 1953, \$37.35. Expressed in real terms, the average cost in constant 1935-39 dollars in 1928 was \$10.07, and in 1953, \$16.92. When it is considered that the logs used in later years were probably of a smaller average size and also perhaps of lower quality, the foregoing costs represent substantial increases in the real cost of sawlogs to the industry.

The spreading-out of the industry into more scattered stands is suggested by the great increase in the number of sawmills in operation. The number of sawmills reported by the Dominion Bureau of Statistics was 3,481 in 1920, 3,531 in 1930, 4,675 in 1940 and 8,194 in 1953.²⁶

The growing shortage of high-quality and easily accessible timber is indicated by the marked rise in stumpage prices in recent years. In British Columbia²⁷ the average stumpage price bid on Douglas fir timber during the period 1931 to 1940 was \$2.44 a thousand board feet.²⁸ In 1952 the average

²⁶Part of the increase in the number of sawmills shown for later years is due to more extensive census coverage of the industry, but there has been also an actual increase in the number of mills.

²⁷British Columbia is the only region for which data on prices of timber established in a free market are available for a period of years.

²⁸This includes an estimated royalty figure to make data comparable to prices for later years.

bid was \$10.84. For the Vancouver Forest District alone the average bid in 1952 was \$17.39. Since most of the fir cut in the 1930's was from the coast region of British Columbia, the average price for earlier years is comparable with that of the Vancouver Forest District for later years as an indication of the trend of stumpage prices. Similarly, the price of hemlock stumpage has increased greatly. During the prewar years hemlock stumpage in British Columbia brought very low prices, and the average bid was \$1.32 a thousand board feet in 1932 and \$1.36 in 1939 (average of all British Columbia sales). The average price bid for hemlock on the West Coast in 1952 was \$9.38.

The foregoing increases are partly a reflection of increased demand for lumber. With lumber prices rising, firms will bid up the price of logs and timber. Stumpage prices would not rise, however, unless timber was in limited supply.

There have also been some wage increases in sawmilling and logging in relation to other industries. This may be seen by comparing changes in the index of wage rates for various industries in Canada. With the wage rate index for each industry equal to 100 for 1939, the levels in 1953 for various industries were: all manufacturing, 291; pulp and paper, 271; iron and steel, 290; mining, 241; logging, 299; sawmilling, 336.

(ii) Production per employee in the sawmill industry

If the output per employee in the sawmill industry is compared with output per employee in all manufacturing, it appears that the sawmill industry has lost ground relatively. For this comparison the net value of production was converted to 1949 dollars, divided by average annual employment to give output per employee, and put on an index basis with 1935-39=100. Data for the lumber industry, the pulp and paper industry, and all manufacturing are shown graphically in Figure 14. Admittedly these are only very rough indicators of productivity and efficiency, but the strongly divergent trends of the sawmill and other industries would support the view that the efficiency of the sawmill industry has not kept pace with efficiency in other manufacturing industries. While the index is not an accurate measure of changes from one year to the next, the sawmill industry appears nevertheless to have improved in the last two years indicated.

It is difficult to isolate the reasons for this trend, for many factors could cause it. In the lumber-manufacturing process it is more difficult to achieve mechanized automatic operations than in many other industries. Logs must be cut to give maximum possible returns, and this requires the treating of every log and every piece of lumber individually. Almost every operation in sawing lumber requires that a decision be made based on examination of the piece. Under these circumstances it is difficult to make production processes automatic.

PRODUCTION PER EMPLOYEE
 SAWMILLS, PULP AND PAPER, ALL MANUFACTURING, 1935-54
 Index of Net Value of Production Per Employee Per Year
 (Constant dollars, 1935-39=100)

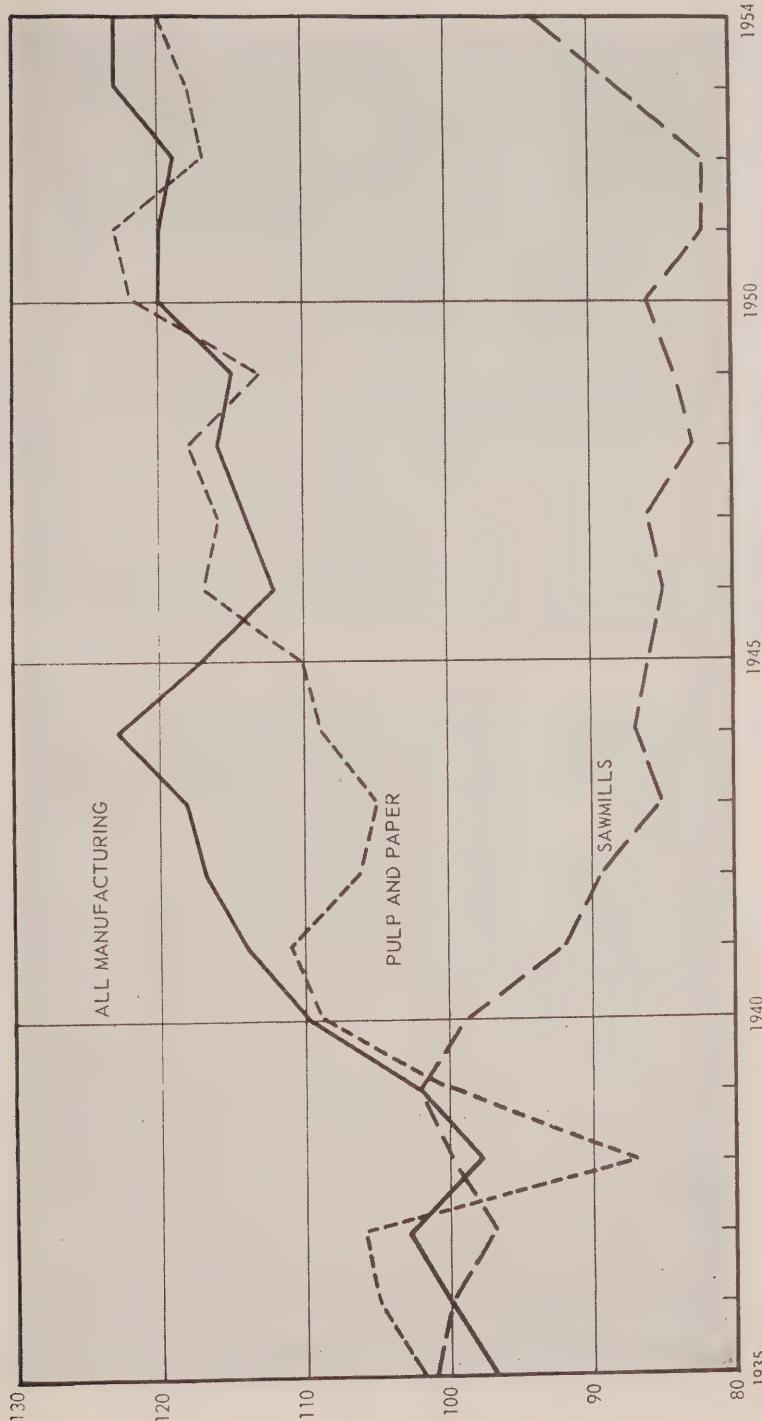
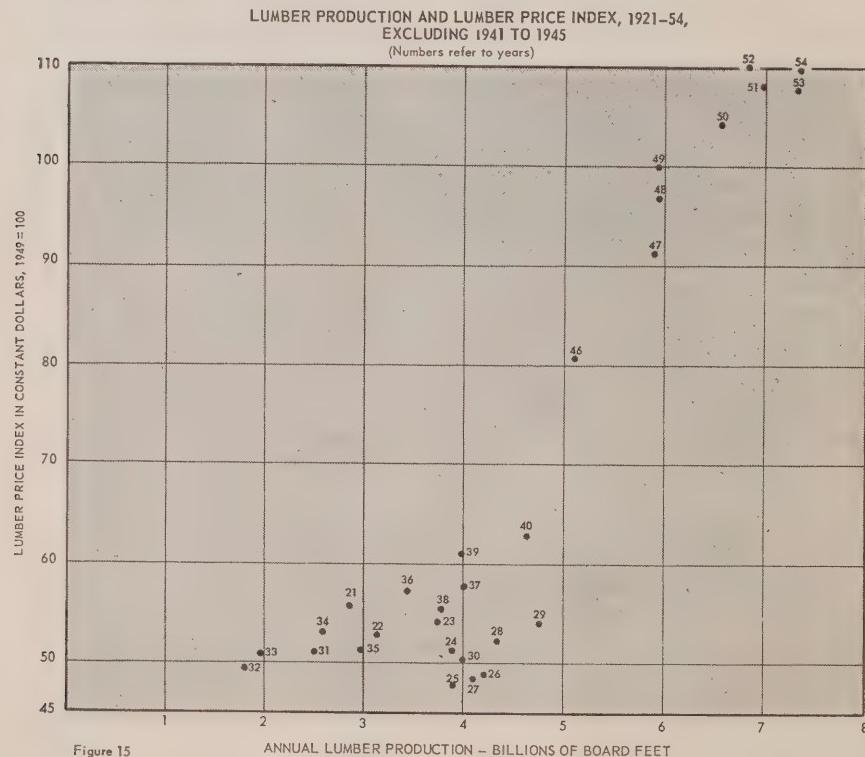


Figure 14

The production process itself has undergone no fundamental change. On the other hand improved equipment has been introduced in many cases. The band-saw is now more widely used; gang trim saws and electric and hydraulically controlled carriages have been introduced; handling equipment has been improved and, in general, machinery has been speeded up and made more accurate. The sawmill industry has benefited from general developments in machine manufacture and motive power. It should be noted, however, that many developments in sawmilling machinery have been introduced for the handling of smaller logs. It should also be noted that, in general, the smaller mills have not shown the same degree of improvement that larger mills have shown.

It is quite probable that one of the main causes of the trend has been the use of smaller-sized logs and lower-quality logs. The decrease in the average size of logs used by the British Columbia coast industry has already been mentioned. The lumber industry has moved into some areas in which the timber is smaller than that found in the production areas of earlier years. In the white pine industry there has been a definite lowering in the quality of timber cut, decay and rot in over-mature stands having become a major problem. This situation may improve as more second-growth stands come into production.



(iii) *Production and price*

In general, it may be said that an increase in lumber prices should bring forth greater production. This can occur by making it profitable to operate areas that could not be economically operated for lumber at lower prices. That this relationship has held in the past is indicated by Figure 15, which compares real prices with lumber production. It may be seen that, in general, high levels of production have been associated with high prices.

Closer examination of this diagram suggests that, despite the high production levels of recent years, there has been a reduction in lumber supply, or that more technically, the lumber supply curve has shifted upward and to the left. It is also possible that the slope of the lumber supply curve has become steeper. This would mean that a given increase in real lumber prices has brought forth a smaller increase in production during the postwar years than during the 1930's.²⁹

(iv) *Summary of changes in lumber supply*

During the period when high-quality timber resources in easily accessible areas were abundant in Canada, production could be increased fairly easily. There were few restrictions on the lumber industry. More recently there has been a tendency to operate on a permanent forest management basis, through policy changes on the part of both individual companies and government. Some regions have only recently shifted to sustained-yield management. The introduction of such policies may remove certain resources from current operation and thus reduce short-term lumber supply but, at the same time it will assure a greater supply for the future.

Thus, with a ceiling on expansion in some developed areas, increases in production must come partly from the movement of the industry to new areas. An example of this may be seen in British Columbia, where industry has expanded greatly in the interior while lumber production on the coast has shown only moderate increases despite the large resources of timber still found there.

It may be said, then, that there has been a reduction in the size and quality of timber resources available to the sawmill industry for current operation. Improvements in manufacturing techniques have not been adequate to offset cost increases brought about by the use of lower-quality raw materials and the payment of higher wages. The output per worker has not kept pace with that of other manufacturing industries. It appears that the supply schedule of lumber for some regions has been reduced. The high level of lumber prices has encouraged the high level of production.

²⁹A more detailed analysis of this type for the United States lumber industry was reported by Zivnuska. The author says: "Such a pattern (of lumber production and prices) is a positive indication that lumber supply has decreased markedly during this 30-year period. The pattern of quantity and prices . . . can be traced only with a supply schedule shifting upward and to the left over time". Zivnuska, John A. "Supply, Demand and the Lumber Market", *Journal of Forestry*, August 1955, p. 547.

Possible future production

The market outlook as set forth in the two preceding sections of this chapter suggests that by 1980 Canada may be able to sell, at home and abroad, 11.6 to 12.1 billion board feet of lumber. We may next ask: *Is the Canadian lumber industry likely to be able to produce this much lumber?* This section attempts to give a qualified answer to that question rather than make a definite production forecast.

Some of the trends that have taken place in the last 30 years will probably continue in the future. There will likely be a further trend toward the use of smaller timber and timber in less dense stands. Also, some of the increase in production will have to come from more remote areas. Douglas fir, on which the early lumber industry in British Columbia was built, occurs in the southern part of the coast region and at lower elevations. The trend in British Columbia has been, therefore, and will likely continue to be, a movement to other species which occur farther north and at higher elevations. Roughly the same situation existed in the white pine region of eastern Canada, which is centred in the southern parts of Ontario and Quebec.

The general movement toward the use of lower-quality timber in more distant areas may mean increasing costs of production for increases in output. With regard to efficiency, here again the industry may have difficulty in introducing new techniques and reducing the amount of labour required per unit of output as rapidly as other industries.

There will likely be upward pressure on wages and perhaps some difficulty in getting adequate labour supplies under conditions of full employment and opportunity in other industries. At present, sawmill labour is paid lower rates than labour in other industries. In 1954, for instance, average weekly earnings in saw and planing mills in Canada were \$55.84, compared to \$77.54 for pulp and paper mills, \$67.18 for the iron and steel products industries, \$60.94 for all manufacturing and \$70.48 for mining.³⁰ Hourly wage rates in eastern Canada show a greater discrepancy. In 1953 the average hourly wage rates for sawmill labourers in Quebec was 78 cents; the rate for labourers in the pulp and paper industry was \$1.28. Data for labourers in Ontario in the same year are: sawmills, 97 cents; the pulp and paper industry, \$1.36.

On the other hand there are possibilities of developments that could improve the efficiency and profits of sawmilling. There seems to be great interest at present among industry leaders in installing new and better machinery. The Forest Products Laboratories of Canada have recently been giving greater attention to cost and efficiency studies in both sawmilling and logging in eastern Canada, and the application of their findings could im-

prove the profitability of the industry. The opportunities in eastern Canada for the use of so-called waste in sawmilling could also increase profits and allow production from stands that could otherwise not be operated.

Whether or not such improvements will be made throughout the industry, it is difficult to say. To a large extent, the industry in eastern Canada is seasonal, and this condition discourages large expenditures on capital equipment. Also, small mills cannot support waste utilization equipment to the same extent as larger firms, nor can they employ the engineering staffs required for development work. Also, there may be a tendency to smaller mills in some areas, and it is the smaller mills that are least efficient today. In fact, we probably have much more knowledge of efficient lumber production than is now being applied, and one of the problems of the industry is to get the smaller mills to apply the methods now known.

In interviews with government and industry leaders in the various regions of Canada, the possibility of expansion of the lumber industry was discussed. The views expressed, together with the opinions on forest resources in general, are summarized in Chapter 8. Information on this point is also available from provincial government and industry briefs to this Commission. The impression gained from these sources is that, over all, only a moderate percentage increase in lumber production can be expected. It must be remembered, however, that rising prices and a strong demand for Canadian lumber can be expected. Under these conditions it will become economic to operate in areas not now considered accessible. Developments may allow smaller-sized timber to be cut profitably. Species not now fully used, such as jack pine, lodgepole pine and poplar, could be cut in increasing quantities. The development of the St. Lawrence Seaway could make it economic to ship lumber overseas from the Great Lakes region. The establishment of rail lines for mining development could open up areas to lumber production. It may be found profitable for the pulp and paper industry to become more closely integrated with lumber production.

Production from areas now developed is, in many cases, government-regulated. Yields that may be realized in the future from such areas under more intensive management and closer utilization may very well prove to be higher than yields now calculated. In the past, in any case, many such calculations have proved to be low. The allowable cut of all timber for the country as a whole, as estimated by the Commission, is probably considerably greater than most people realized before present inventories were completed. In times of rising prices small sawmilling concerns have been able to find patches of timber that could be cut into lumber where it was thought no sawtimber existed.

Thus, two sets of forces will affect future production. On the one hand, there are those pointing to higher costs; on the other, there are large re-

sources and the possibility of increasing production opportunities. With market developments indicating that there may be a market for 11.6 to 12.1 billion board feet of lumber at increased prices, it seems possible that this level of production could be attained in 1980.

Shingles

The shingle industry is centred in British Columbia and based almost entirely on the use of one species of timber—western red cedar. It is an export industry, 87% of total shingle production having been exported during the period 1950 to 1954, almost all of which went to the United States. Average annual revenue from exports of shingles during that period was \$25 million. At present there are about 70 mills manufacturing shingles in British Columbia.

The long-term trend of shingle production in Canada has been downward. Production in the latest 5-year period was 75% of the volume produced for the period 1925-29 and about 90% of the average for the period immediately preceding World War II. The reason for this is that shingles have lost a large part of their traditional market.

The British Columbia industry in recent years has shipped to the United States about the same quantity as has been produced by the red cedar shingle industry in the United States, and Canada as a whole has supplied 35% to 40% of total United States consumption of shingles and shakes. Exports to other countries have been only about 3% of production from 1950 to 1954. Statistics on production and shipments of shingles are given in Tables 17 and 18.

The price of shingles has increased about in line with lumber prices, and in real terms prices in recent years have been about double the prewar level. Shingle prices vary greatly from year to year. For example, the Dominion Bureau of Statistics index of shingle prices (1949 = 100) increased from 100 in 1949 to 144 in 1950, and by 1952 it was down to 115. Shingles are highly dependent on one market—residential construction in the United States—and have had a “boom or bust” type of record.

Consumption of shingles has dropped both in Canada and in the United States during the past 20 or 30 years. Fire-resistant shingles of other materials have replaced wooden shingles for residential roofs. Only a small percentage of new houses use shingles on the roof. Siding is now more important than roofing in providing a use for shingles. Wooden shingles meet stiff competition in this market too from shingles made of other materials as well as from other types of siding. One of the reasons for the loss of markets is the high cost of application of wood shingles. The cost of cedar shingles is about the same as asbestos shingles, but asbestos shingles are cheaper to apply as they are put on in panels.

For the future, consumption of shingles will depend on user preference in residential construction and on the costs of shingle application compared with costs of competing products. In parts of the United States, wooden shingles have become a prestige item in housing. The shingle industry is keenly aware of its marketing problems, and considerable work has been done in the development of new types of shingles, pre-stained shingles and shingle panels. With such developments it could not be unexpected that shingles could retain their present percentage of the market for siding and roofing in the United States. Even with a declining share of the market, however, the increase in the number of houses built in the future may result in shingle consumption in the United States being at least equal to the consumption of the last few years. The same situation can be expected to apply in Canada. With an increase in house-building in the future, it seems reasonable to expect consumption to be at least up to the level of recent years.

In regard to future exports and production, two points are important. First, the reserves of western red cedar in British Columbia are large by comparison with the cedar cut in recent years. In the future, the volume of cedar production will likely increase, both absolutely and as a percentage of total lumber production. Under present utilization patterns, about 40% of cedar log production goes for shingles; and in the future a high volume of cedar lumber production will mean that there will be a considerable volume of cedar available for shingle production. The second point is that the remaining volume of western red cedar in British Columbia is greater than the volume of western red cedar remaining in the western United States. Cedar resources of the western United States are reported to be 32 billion board feet,³¹ whereas 67 billion board feet of cedar are reported for British Columbia.³²

Table 17
SHINGLE PRODUCTION IN CANADA

Period	Average annual production (thousand squares ^a)
1925-29.....	3,717
1930-34.....	2,258
1935-39.....	3,111
1940-44.....	3,394
1945-49.....	2,864
1950-54.....	2,774

^a A square contains sufficient shingles to cover 100 square feet.

SOURCE: Dominion Bureau of Statistics.

In view of developments on the market side, as well as the large resources of cedar in British Columbia compared with those of the United States, it would appear that the level of shingle exports to that country in

³¹Net volume of live sawtimber on commercial forest land (does not include Alaska, which contains about 5 billion board feet of cedar on the coast), *Timber Resource Review*, Chap. IX, Table 27, p. 46.

³²Accessible timber of merchantable size, sawtimber, *Forest and Forest Products Statistics, Canada, 1956*, Table 4, p. 13.

1980 could be at least equal to the level of recent years. If, on the other hand, promotional work proves successful, exports of cedar shingles to the United States could increase substantially.³³

Table 18

SHIPMENTS OF BRITISH COLUMBIA RED CEDAR SHINGLES
Annual average, 1950-54

To	Thousand squares	Percentage
United States of America	2,302	80.4
Other countries	74	2.6
Total exports	2,376	83.0
Eastern Canada	82	2.8
Prairie Provinces	241	8.4
British Columbia	165	5.8
Canada (total)	488	17.0
Total shipments	2,863	100.0

NOTE: Shipments, as reported by the British Columbia Lumber Manufacturers Association, have been greater than the total production of shingles in Canada reported by the Dominion Bureau of Statistics.

SOURCE: *Annual Report, 1954*, British Columbia Lumber Manufacturers Association.

With regard to future prices, it will be recalled that shingle prices have increased greatly from the level of the prewar period. On the cost side, shingle production is subject to upward pressures similar to those affecting lumber, and on this basis it may be expected that prices in the future will continue to increase. However, because of strong price competition from other materials, any marked increase in prices would tend to cause shingles to be replaced by competitive products. For this reason it is assumed, for purposes of this study, that shingle prices will not rise above the 1952-54 average level. On the other hand, a higher degree of manufacturing at the factory would seem a likely development, and on this account the average value of shingles produced and exported could increase.

Other Allied Industries

The plywood and building board industries are of more recent development in Canada than the lumber industry and have shown a more rapid rate of growth in the postwar period.

The products in this group—softwood plywood, hardwood plywood, hardboard and insulation board—compete with lumber for markets in construction and manufacturing. There is also market competition among these products. Because of very rapid developments in recent years, it is difficult to estimate the future consumption of each of the products. This part of the study, therefore, gives an estimate of the quantity of these products (mea-

³³In this regard, the Stanford Research Institute estimated consumption of shingles and shakes in the United States to be 4.4 million squares in 1975, compared with 6.2 million squares in 1952, and that imports of shingles in 1975 would be 2.4 million squares. (*America's Demand for Wood*, p. 70.)

sured in square feet) that may be consumed in the future. A possible division of markets among the products is also suggested, but this must be considered merely as a matter of opinion. Consumption of these products is discussed later in this chapter.

A somewhat different type of board—wood-particle board—has entered the market in the past few years. Particle boards are made of wood chips or shavings bonded into panels with an adhesive. Production in the United States and in western Europe has shown a rapid rate of increase in the past five years. Although particle boards are produced in Canada, production so far has been very small in relation to other boards. There can be no doubt that production will increase in the future to significant levels, but because developments are so recent, estimates of future production have not been made.

A brief outline of each of the industries is given as a preliminary. Some data for the products are given in Table 19.

Table 19

THE PLYWOOD AND BUILDING BOARD INDUSTRIES

*Annual average, 1952-54
(millions of square feet)*

	Production	Exports ^a	Imports	Consumption
Softwood plywood (1/4" basis).....	606	8	—	598
Hardwood plywood (1/4" basis).....	148	63	17	102
Insulation board (1/2" basis).....	268	3	27	292
Hardboard (1/8" basis).....	147	39	18	126

^a See footnote following Table 20.

1. *Softwood Plywood*

The softwood plywood industry, centred in the coast region of British Columbia, has been based on the high-quality Douglas fir timber of that region. Production in recent years has gone almost entirely to domestic consumption, exports between 1950 and 1954 having been less than 2% of production.

The value of production of softwood plywood in 1953 was \$45 million and in 1954 it was \$46 million.³⁴ The industry is thus becoming a sizable one, and the value of production is now more than 10% of the value of lumber production. The industry, however, uses only a small percentage of the timber used by the lumber industry. For instance, the veneer and plywood industry used 231 million board feet of softwood logs in 1953, while the lumber industry that year used 6,904 million board feet of softwood logs. Thus, the veneer and plywood industry accounted for less than 5% of the volume of softwood logs used by the lumber industry.

³⁴Value of production for 1955 published after the above was written, was \$57 million.

Table 20

SOFTWOOD PLYWOOD, 1948-55

(millions of square feet)

	Production ($\frac{1}{4}$ " basis)	Exports (all thicknesses)	Consumption	Per capita consumption (sq.ft.)
1948.....	395	82	313	24
1949.....	360	19	341	25
1950.....	389	3	386	28
1951.....	483	22	461	33
1952.....	464	12	453	31
1953.....	629	3	626	42
1954.....	725	8	717	49
1955.....	930	23	907	58

NOTE: 1. Production is reported on a $\frac{1}{4}$ " basis. Exports are based on all thicknesses. If exports were on a $\frac{1}{4}$ " basis, the number of square feet exported would be larger than that shown. Therefore, actual consumption on a $\frac{1}{4}$ " basis is probably lower than shown in the table. Because of the relative unimportance of exports, the difference will not be great.

2. Totals may not add because of rounding.

SOURCE: Dominion Bureau of Statistics.

Production has increased very greatly in the past few years. As may be seen from Table 20, production in 1955 was about 2½ times the volume produced in 1949.

Consumption

Softwood plywood has found wide application in construction in recent years. Formerly its main application was for inside panelling and finish. The development of waterproof glues has led to its use for outside purposes, and it has found increasing use in construction for sheathing, siding and sub-flooring. Concrete forms and temporary work in construction projects require more and more plywood. For most of its applications, plywood has replaced lumber. It is a standardized, uniform product and, because of the large size of the panels, its application costs are lower. For forms and similar structures, it may be re-used. Plywood has been vigorously advertised in recent years, the advertising being aimed particularly at the home repair and fix-up market.

Future consumption of softwood plywood in Canada is discussed farther on, a possible consumption of about 2,100 million square feet ($\frac{1}{4}$ " basis) being suggested for 1980. This level would be about 2.4 times the average consumption for the years 1953 to 1955 and about double the consumption in the year 1955.

While there may be possibilities for increased exports, it would not appear that exports would account for a larger percentage of production than in recent years. Softwood plywood entering the United States is subject to a 20% tariff and it would appear unlikely that the Canadian industry could compete successfully with the United States plywood industry with such a tariff.

By North American standards, softwood plywood has not been widely used in the United Kingdom. Also, Canadian softwood plywood competes with low-cost building boards (hardboard and insulation board) from European sources. Unless Canadian softwood plywood can be sold in the United Kingdom at prices lower than at present (in relation to the prices of competing products), it does not seem that any marked expansion of exports to the United Kingdom could be expected. Plywood is shipped to many other countries in small quantities. The value of exports to countries other than the United Kingdom and United States was between \$200 thousand and \$600 thousand a year during the years 1950 to 1955. While there may be opportunities to increase exports to some countries, there is no reason to believe that exports could be increased to such a degree as to have an important effect on the Canadian economy.

Production aspects

As already mentioned, the softwood plywood industry is based today on the large-sized, high-quality Douglas fir timber of the coast region of British Columbia. Until recent years it was generally believed that only the highest quality of timber was suitable for peeling. However, technical developments in the industry have permitted the use of smaller-sized and lower-quality logs. It is quite likely that further developments will allow the use in the future of logs of lesser quality than those now in use. Also, other species—hemlock, spruce and poplar³⁵—will likely be used to a greater extent for plywood. The resources available to the industry in the future will be of lower quality than those being used today, but it seems that developments will provide adequate resources for the manufacture of the quantity indicated in the foregoing paragraphs.

2. Hardwood Plywood

The hardwood plywood industry is relatively new, prewar production being small and mostly in crating grades. The war gave considerable impetus to the industry and since then it has shown rapid growth in production and consumption. Yellow birch has been the main species used, and the export of birch plywood to the United States has been an important business in recent years.

Data concerning the industry are given in Table 21.

Consumption

Hardwood plywood is used for decorative panelling in commercial and residential buildings, in furniture manufacture and in the manufacture of other products. Its use has expanded greatly in the last few years, and it is

³⁵Poplar plywood is classified as a hardwood plywood, but it would seem to be potentially important for structural uses

expected that demand will continue to grow. Because consumption depends to a large degree on consumer taste, it is difficult to determine with any degree of certainty. A Canadian consumption level of about 250 million square feet has, however, been estimated for 1980.

Table 21

HARDWOOD PLYWOOD, 1949-54

(millions of square feet, $\frac{1}{4}$ " basis)

	Production	Exports ^a	Imports	Consumption
1949	74	19	—	55
1950	101	51	1	51
1951	102	50	4	56
1952	131	60	8	79
1953	150	55	19	115
1954	164	75	23	111

NOTE: Totals may not add because of rounding.

a Exports reported in all thicknesses.

Exports

Exports averaged 63 million square feet in 1952-54, and practically all went to the United States. Canada will probably continue to have an export market in the United States as it has been estimated that demand for hardwood plywood and veneer in that country will double during the 1952-75 period.³⁶ Hardwood plywood, however, constitutes a relatively small percentage of the timber used in the United States, where hardwood resources are large. Whether Canadian exports will increase depends to a large extent on the quality of the raw material available to the Canadian industry compared with that used by the United States industry, and the profitability of manufacturing plywood in Canada in competition with United States producers. It is estimated that exports in 1980 may be about the same as in recent years, or 60 million square feet.

A questionable point for the future of hardwood plywood is the supply of veneer logs. Readily accessible supplies of high-quality yellow birch have been diminishing, and opinion is that the supply of veneer logs could restrict the expansion of the industry. If yellow birch resources prove greater than they are currently thought to be, or if other species of hardwoods can be used more extensively, production of hardwood plywood could be greater than the amount already estimated.

3. Hardboard

Hardboard is a homogeneous wood-fibre board compressed to medium or high density and manufactured in panels one-tenth to five-eighths of an inch thick. It has a smooth, hard surface and lends itself readily to the appli-

cation of a wide variety of finishes and surface designs. The first hardboard mill in Canada started in 1940. There are now three mills in operation—one in Quebec, one in Ontario and one in British Columbia.

The industry is primarily domestic. That is, most of its production has been consumed in Canada. During the period 1950 to 1954, 78% of shipments were domestic and 22% were export. As is the case with other forest products, hardboard has been shipped to many countries, but the bulk of exports have gone to the United States and the United Kingdom. The raw material requirements of the industry are not exacting from a technical point of view. Sawmill and veneer mill waste, as well as roundwood of several different species of trees, is used for hardboard production in Canada.

As may be seen from Table 22, hardboard production in Canada has increased greatly since 1947. Until that year only one plant was manufacturing hardboard in Canada. Since then capacity has risen to about 250 million square feet, and total shipments in 1955 were 204 million square feet.

Table 22
SHIPMENTS OF HARDBOARD FROM CANADIAN MILLS
1947-55

(millions of square feet, 1/8" basis)

Year	Total shipments	Domestic shipments	Export shipments
1948.....	71	70	1
1949.....	89	61	28
1950.....	91	80	12
1951.....	109	93	15
1952.....	138	100	38
1953.....	156	117	39
1954.....	146	107	40
1955.....	204	120	83

NOTE: 1. Totals may not add because of rounding.

2. Imports of hardboard are not reported separately but are estimated to have averaged 17 million square feet for the years 1952-54.

Consumption

Consumption of hardboard has increased greatly in the postwar period. It has found a wide variety of applications, having been used as wall and ceiling panelling and millwork in construction, in drawers and the backs of such items as dressers and desks, and in table tops, counters and many manufactured products. It may be expected that hardboard will continue to find new uses, and, as suggested farther on, consumption in Canada may be about 450 million square feet.

Exports

For the years 1952 to 1954 exports of hardboard averaged 39 million square feet, or 27% of production. From present knowledge it would not

appear that any important increase in exports can be expected. There is a 7½% duty on hardboard entering the United States. The quantity of sawmill waste and low-cost wood available in the United States for the manufacture of fibreboards would suggest that that country will be able to supply its own requirements and that Canadian producers could not compete effectively in the market. While exports to the United States in 1955 were considerably larger than the average figure just given, capacity in the United States is currently being expanded, and exports to the United States could be reduced in the next few years.

In the United Kingdom and other markets, Canadian hardboard has been unable to compete on a price basis with low-cost board from Europe, and a sizable overseas market cannot be expected unless Canadian producers are able to bring costs down to competitive levels. Exports, therefore, may be about equal to the 1952-54 average, or about 40 million square feet. The hardboard industry is able to use a wide variety of fibre resources, so that raw material supplies would not seem to be a problem. The real price of hardboard will likely remain constant, and this will mean a reduction in relation to lumber.

4. Insulation Board

Insulation board is a low-density material manufactured in panels with a standard thickness of ½ inch. The industry started with one small mill in 1913, and production for the next decade was small. A mill was built in Quebec in 1927, and since then the industry has shown fairly steady expansion except in the depression years. There are at present eight mills in Canada, and an additional mill is being built in Ontario.

Table 23

SHIPMENTS OF INSULATION BOARD FROM CANADIAN MILLS (millions of square feet, ½" basis)

Year	Total shipments	Domestic shipments	Export shipments
1948.....	221	190	31
1949.....	221	217	4
1950.....	229	227	2
1951.....	286	273	13
1952.....	243	237	6
1953.....	278	277	1
1954.....	283	280	3
1955.....	332	303	29

NOTE: Imports of insulation board are not reported separately but have been estimated at an average of 27 million square feet for the years 1952-54.

The insulation board industry serves mainly the domestic market, exports in the last few years being only about 1% of production. Before World War II, however, exports were relatively more important and much greater in absolute amount. Imports have recently been about 10% of production.

These imports have come from the United States, and are believed to have consisted mostly of acoustic tiles and specialty products. Data on shipments are given in Table 23.

Consumption

Insulation board is used for construction purposes, for lath, panelling, sheathing and tiles. It combines structural strength with sound- and heat-insulating properties. It has shown a marked rise in consumption in recent years, consumption in 1954 being five times the prewar level. The level of consumption in the future will depend on the level of building activity in Canada. However, the rapid rate of increase that has been shown so far cannot be expected to continue, as insulation board is meeting stiff competition from plywood, gypsum board, hardboard and other products. By 1980 the growth of the Canadian economy will likely result in consumption of insulation board about double recent levels, or 600 million square feet.

Exports

In recent years exports have been relatively unimportant. There is a tariff of $7\frac{1}{2}\%$ on shipments to the United States. Canadian producers have not developed a permanent market in that country. Exports have been high when demand in the United States has been above normal or Canadian producers had surpluses available. It is conceivable that a larger and steadier market in the United States could be developed. However, because the industry is able to use a wide variety of raw materials, United States producers should be able to supply the requirements of that market, and it cannot be expected that exports to the United States will take a significant percentage of Canadian production. In overseas markets, Canadian board meets stiff competition from low-cost board from Europe, and it is unlikely that a large overseas market could be developed.

5. Consumption of Plywood and Building Boards

As already mentioned, hardwood and softwood plywood and building boards compete with one another for many uses. Both hardwood and softwood plywood, for instance, are used for the manufacture of doors; softwood plywood, hardwood plywood and hardboard are used for cupboards; softwood plywood, insulation board and hardboard are used for sheathing. Many more examples could be given of uses for which two or three of these products are used.

For the individual user it is often price that determines which product will be selected. For some purposes certain technical qualities are the important considerations, and an improvement in quality or the development of a new finish may influence a user to switch from one product to another.

A good example of such a development is the recent use of hardboard for the manufacture of television cabinets.

Technical developments in fields affecting these products have been very rapid in recent years. The products are also subject to the vagaries of consumer preference. An improvement in appearance can quickly shift a market from one product to another. Since technical developments in finishing with new kinds of paints and overlays will continue, it is almost impossible to predict what quantity of one kind of board may be used for a particular purpose 10 or 20 years from now.

Hence, taken all in all, these products have qualities that are basically desirable for construction and certain manufacturing uses. There will almost certainly be changes in their use pattern, but while some markets may be lost, others will be gained. The industries in this group are aware of the technical competition, and work in this field should assure a continuing and increasing demand for their products.

In any consideration of future consumption, the past consumption of the four products taken together should be taken into account. While it is not possible to get for each product a unit of measurement that would allow direct comparison, that used in Table 24, which shows consumption in Canada, gives a fair comparison.

Since these boards are used mainly in construction, an estimate of future demand should be based on the level of construction activity. New construction in the period 1952-54 averaged \$2,742 million (1949 dollars). In the same period board consumption averaged 1,126 million square feet so that 0.411 square feet of board were used per dollar of construction. The rate of use per dollar in 1949 was 0.38 square feet; in 1950 it was 0.35 square feet. On the assumption that per dollar use in 1980 will be about 30% higher than the average for 1952-54 and that construction expenditures will be \$6,300 million (1949 dollars), consumption of board in 1980 would be about 3,400 million square feet. On a per capita basis this would be 128 square feet per capita, compared with 85 square feet in 1954.

A continuation of the recent rapid increase in the consumption of these products would result in a future level much higher than the foregoing estimate. These products, however, have been in a development stage, and for most products rapid early increases tend to level off after a time. It is difficult to say at what point the levelling off may occur and it is quite possible that consumption may, in fact, exceed the assumed level for 1980 by a considerable margin. Should this occur it will likely mean a further invasion of lumber markets and consequently a lower level of lumber consumption than has been estimated.

Table 24

CONSUMPTION OF PLYWOOD AND BUILDING BOARDS (millions of square feet)

Year	Fibre building boards ^a	Softwood plywood ^b	Hardwood plywood	Total
1949.....	397	360	55	812
1950.....	340	386	51	777
1951.....	389	461	56	906
1952.....	367	453	79	899
1953.....	441	626	115	1,182
1954.....	445	741	111	1,297

^a Hardboard on $\frac{1}{8}$ " basis and insulation board on $\frac{1}{2}$ " basis. Data are domestic shipments plus imports.

^b $\frac{1}{4}$ " basis.

The distribution of this quantity among the four products must be merely a matter of conjecture. Opinion in the trade suggests that the fastest rate of growth is likely to be shown by hardboard. Softwood plywood is also expected to grow at a rapid rate. Insulation board may have the slowest growth rate of the group, and hardwood plywood is expected to progress at a medium rate. In Table 25, the 1980 consumption level thus suggested for each product is compared with its 1952-54 average.

Table 25

CONSUMPTION OF PLYWOOD AND BUILDING BOARDS 1952-54 AND 1980 (millions of square feet)

	1952-54	1980
Softwood plywood.....	606	2,100
Hardwood plywood.....	102	250
Hardboard.....	126	450
Insulation board.....	292	600

This is only tentative. Technical developments could occur which would result in quite a different pattern within the next 25 years.

6. Veneer

The plywood industry also produces veneer. Most of the veneer is exported to the United States, the shipments including both hardwood and softwood veneers. The annual production and export averages for the years 1952 to 1954 are as follows:

Hardwood Veneer

Production (millions of square feet, 1/10" basis)	262
Value of production (thousands of dollars)	11,154
Exports (millions of square feet, all thicknesses)	309
Value of exports (thousands of dollars)	7,985

Softwood Veneer

Production (millions of square feet, 1/10" basis)	222
Value of production (thousands of dollars)	2,676
Exports (millions of square feet, all thicknesses)	176
Value of exports (thousands of dollars)	2,150

Softwood veneer is exported principally by one company in British Columbia which has a plywood plant in the United States. Hardwood veneer is mainly birch.

The consumption of these products in Canada will likely increase in line with the consumption of plywoods. Exports, as regards softwood veneer, are under special arrangement, and it does not seem likely that they will increase greatly unless other Canadian companies establish plywood plants in the United States. Sales of hardwood veneer to United States consuming plants are now well established and should continue. Because of the growing demand for plywood and veneer in the United States, the opportunity for sales of veneer in that market should increase. Again, the supply of yellow birch veneer logs may be the limiting factor. As already mentioned, there is a belief that the supply of veneer-quality birch logs may not be sufficient to support any great increase in the production of veneer and plywood. If this is so, the use of veneer for plywood and other products manufactured in Canada may not allow an increase in exports of birch veneer in the forecast period.

A recent development affecting plywood and veneer production is the large increase of imports of hardwood plywood from Japan by the United States and Canada. Plywood from Japan is imported at low cost and has taken over a large percentage of the United States market. It is now entering Canada in increasing quantities. The long-term effects of this development cannot be foretold but it has already caused increased competition and lower prices for hardwood plywood and veneer, both in the United States and Canada, with resulting decreases in profitability of the industry.

5

PULP AND PAPER

Background and Present Structure of the Industry

Pulp and paper production in Canada spans a period of just over 150 years. It was in 1805 that the first mill, located near Lachute, Que., started operation. In that first mill, paper was produced by hand; the raw materials were primarily linen and cotton rags; the products were wrapping paper, paperboard and blotting papers, and the mill supplied only the nearby local market.

Today, in contrast, the industry is one of the most highly mechanized. It still uses linen and cotton rags but, in relation to its pulpwood requirements, the quantity of these raw materials is tiny. The products it now markets are numbered in the hundreds, and much more tonnage is sold in export markets than is consumed within Canada.

Thus, in each of its basic characteristics, the industry has been transformed in the course of its growth and development. In part, its growth could be called evolutionary in so far as it has stemmed gradually from such things as refinements in process techniques, improvements in machine design and the gradual expansion of markets in line with growing population and rising living standards.

Apart from this evolutionary growth, however, it is possible also to distinguish certain important developments or factors which have had something of a revolutionary effect on the growth of the industry. Widely divergent in nature—they range from the introduction of wood as a raw material to the coming of peace in 1945—each of these sharply altered the course of development and contributed in a major way to the transformation which has come about. It is convenient to use these revolutionary factors as milestones to mark off distinct phases in the industry's growth. Before being

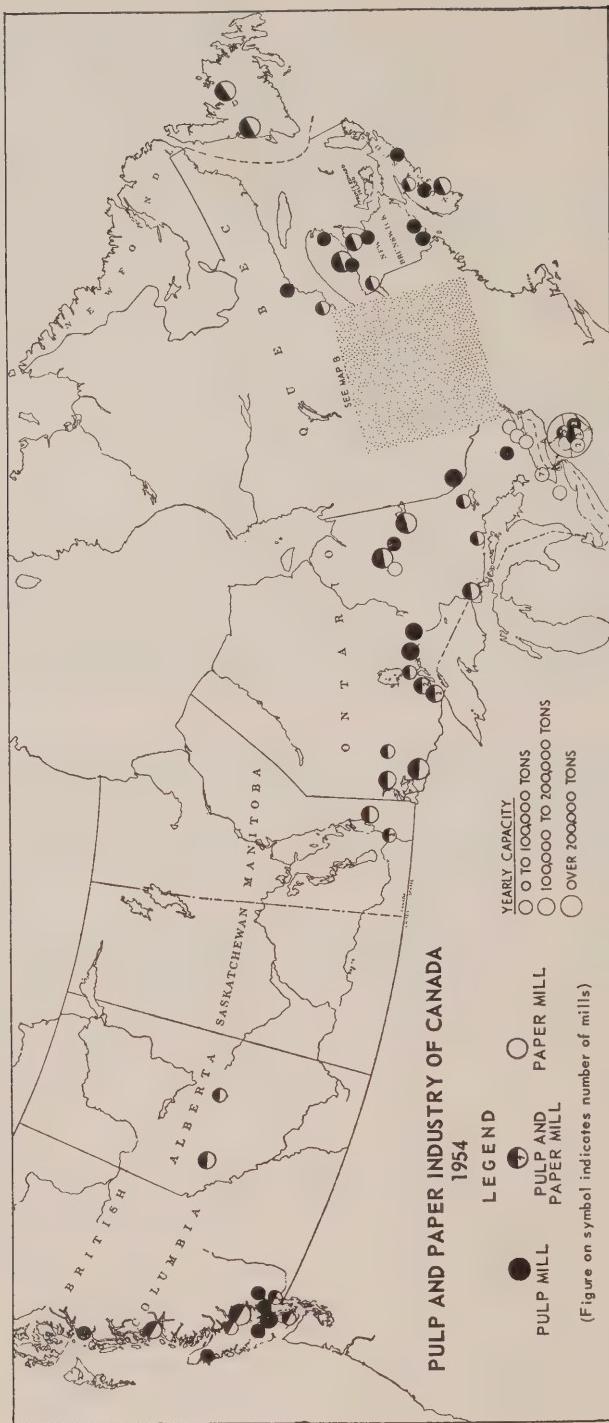


Figure 16

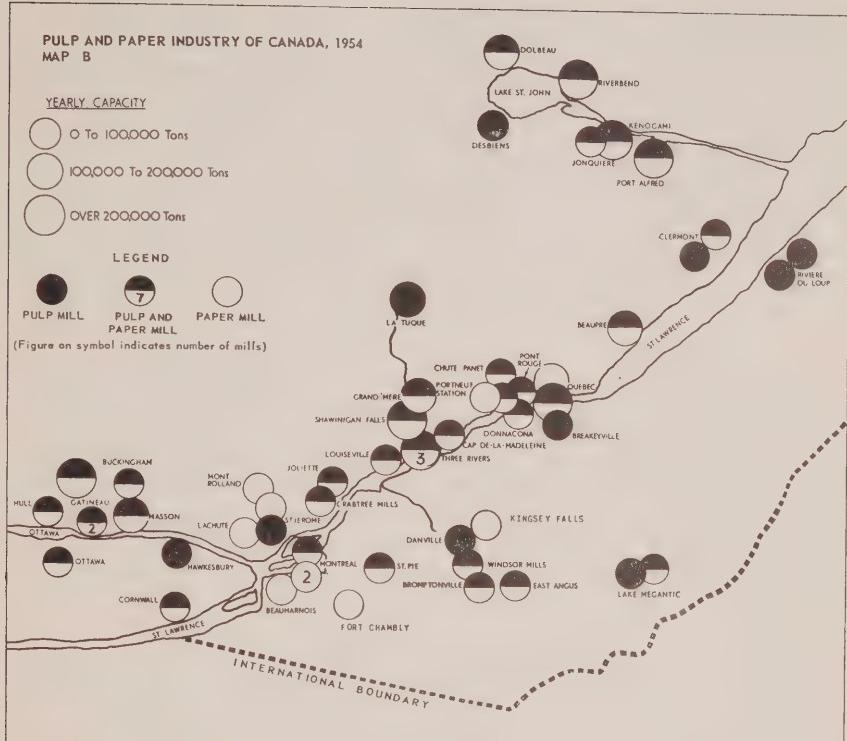


Figure 17

examined in greater detail, these phases may be listed in terms of time periods, as follows:

1. Early growth: 1805-71
 2. Technological development: 1871-1911
 3. Market development: 1911-29
 4. Depression and recovery: 1929-45
 5. Postwar development: 1945 to the present.

1. Early Growth: 1805-71

There is little information on the origin and early expansion of pulp and paper production in Canada other than a series of places and dates, to mark the establishment of each small new mill: Lachute in 1805; Portneuf, Que., in 1810; Bedford Basin, N.S. in 1819; and so on. Progress was slow: in 1851 the Census recorded five mills in Lower Canada and the same number in Upper Canada. By 1861 Lower Canada could claim six mills.

So it continued until roughly the time of Confederation, when there occurred two technical innovations of great importance: the first use of wood in pulping and the introduction of chemical pulping with the soda process. In the new use of wood for pulping, a plentiful and economic raw material was substituted for materials which, if they had not already done so, would impose limitations on growth due to the related characteristics of scarcity and high cost. The new use of chemical soda pulp made possible the quality improvements which were the first steps toward diversification of production. Clearly, these two factors materially altered the potentialities for and the direction of the industry's expansion.

The year 1871, which is the first year for which useful statistical information is available and which also coincides with the introduction of the two technical factors just mentioned, may be taken as marking the end of the first phase of industry development. Actually, Canada's first soda pulp mill was built at Windsor Mills, Que., in 1864, and the first groundwood pulp mill began operations at Valleyfield, Que., in 1869; but neither of these mills was mentioned in the Census of 1871 and the picture of the industry presented by those census data therefore excludes these two revolutionary developments.

The data show that there were 21 paper mills in operation and that these employed a total of 760 workers, or an average of about 35 to a mill. No figures are given for the volume of output, but the total value was put at \$1.1 million. The annual output thus averaged about \$50,000 per mill. One could conclude that for the period 1805-71, the first 65 years of operations, the industry showed little sign of the growth potentialities which lay ahead.

2. Technological Development: 1871-1911

The dual technological breakthrough which had brought wood and chemical pulping to the industry was rapidly extended and diversified through the next phase of growth, which continued through the period to 1911. Thus, for example, in 1881 the Census reported five wood pulp mills, and by 1891 the number had grown to 24. During the latter 1880's the first of Canada's sulphite mills came into operation at Sheet Harbour, N.S., and this was quickly followed by mills at Cornwall in 1888 and in Hull in 1889. Still another important innovation came in 1907 with the completion of the first sulphate pulp mill at East Angus, Que.

Each of these new processes probably deserves to be called a revolutionary development. Certainly each was of major importance in adding new elements of diversification and therefore new dimensions to the industry's prospects. This broadening of the array of available processes enabled the industry to satisfy the lengthening list of pulp and paper requirements, and this is reflected in the rapid expansion of the industry throughout the second

phase. The Census of 1901 reported 53 mills in operation as against the 21 operating 30 years earlier; the number of employees had grown to more than 6,200 as against the mere 760 of 1871. Thus the average size of the mill unit about tripled to 115 employees.¹

But throughout the 1871-1911 period the industry remained primarily geared to the requirements of the domestic market. As late as 1900, exports of paper and manufactures of paper were valued at only \$29,741. Pulp exports, it is true, had fared better, reaching a value of \$1.8 million in 1900. But the market frontiers would now have to be extended if rapid expansion was to continue.

3. Market Development: 1911-29

The year 1911 has been chosen to mark the end of the second phase of development—or, more accurately, to mark the beginning of the third phase. In that year a revolutionary event occurred which did indeed transform the industry's prospects. In 1911 the United States granted free entry to newsprint from Canada, and in 1913 free entry was extended by that country to woodpulp and newsprint from all sources. Free access to the large and rapidly growing United States market made expansion possible on a new scale. It also, incidentally, cast the industry in its present mould, shaping expansion along predominantly newsprint and pulp lines. The extent of the transformation is readily seen in Table 26.

The table presents *before and after* views of the industry, the revolutionary event of 1911 being roughly equidistant from the two years shown. The dollar figures are not perhaps particularly useful indicators of the growth in this period. While, again, there is no composite price index for pulp and paper products in these early years, it is known that 1920 was a year of high prices. Newsprint prices alone, serving as a rough guide, indicate that the price in New York rose to 6.5 cents a pound in 1920 against 1.8 cents in 1900. What is significant in the middle third of the table is the changed distribution of shipments: in 1900 about four-fifths of production (by value) was sold in Canada, while by 1920 the proportion was under one-third. In the tonnage figures, the growth of newsprint production is striking: from a negligible tonnage in 1900, production grew to 876,000 tons in 1920 and in so doing, it came to account for nearly one-half of end-product output. It will be noted that market pulp, too, fully maintained its relative position.

The United States tariff actions of 1911 and 1913 raise questions of broader interest than their effect on the growth of the Canadian pulp and

¹It is interesting to note that average output per employee fell from \$1,410 in 1871 to \$1,383 in 1901, superficially a most startling result after 30 years of increased mechanization. Tonnage data are not available for the two years in question nor are price data, which would have permitted the conversion of the value figures to a volume basis. Still, there is little doubt that the answer lies in falling prices, made possible by higher productivity through mechanization. In his book, *Newsprint Paper in North America* (Newsprint Service Bureau, New York, 1948), R. S. Kellogg records United States newsprint prices for these early years. In 1871, newsprint cost 12.1 cents a pound delivered in New York; in 1901, the figure was 1.8 cents a pound.

paper industry alone, and it may be worthwhile to consider some of them briefly here. One set of questions—those concerning the reasons for the United States action—is of some significance. In 1900, Ontario placed an embargo on exports of pulpwood cut from Crown Lands, and in the ensuing 13 years similar action was taken by all other provinces. It is sometimes said that these actions forced the United States to upgrade its wood-fibre imports from Canada from pulpwood to wood pulp and newsprint, and it has been suggested that this technique might be used elsewhere to foster further processing in Canada. But two additional factors should be considered in analysing the United States action.

- (1) With the rapid growth of United States pulp and paper requirements, fears were expressed around the turn of the century that United States forests, particularly in the Northeast, were becoming depleted. Attention was thus drawn to Canada as an alternative source of supply for pulp and paper products.
- (2) For United States newspaper publishers, expanding rapidly, the relatively untapped Canadian forests held out the opportunity to develop a large and economic new source of supply which would add a competitive spur to the domestic industry then supplying their needs.

**CANADIAN PULP AND PAPER INDUSTRY
SUMMARY STATISTICS: 1900 AND 1920**

	1900		1920	
Number of mills.....	53		100	
Employees (ex. woodlands).....	6,236		31,200	
Value of output (millions \$).....	.6		236.4	
Value of exports (millions \$).....	1.8		163.1	
<i>Distribution of shipments</i>				
	1900		1920	
	Millions of dollars	Percent	Millions of dollars	Percent
To Canada.....	6.8	79	73.3	31
To U.S.	1.2	14	135.0	57
To other countries.....	.6	7	28.0	12
Total.....	8.6	100	236.3	100
<i>Volume and type of production</i>				
	1900		1920	
	Thousands of tons	Percent	Thousands of tons	Percent
Newsprint.....	—	—	876	43
Market pulps ^a	75	38	820	40
Other papers and paperboard	125	62	339	17
Total.....	200	100	2,035	100

^a Paper-pulp exports.

SOURCE: Dominion Bureau of Statistics.

As regards the depletion threat, subsequent events have proved it unfounded. For example, pulpwood consumed in the northern states rose from 1.41 million cords in 1899 to 2.87 million cords in 1910 and 3.83 million cords in 1920. Probably the increase would have been greater had not free entry been granted to pulps and newsprint, but the actual growth experienced suggests no problem of depletion. The important point, however, is that such fears were apparently felt and expressed, and this might have strengthened the case for the tariff action.

It is possible that each of the factors—provincial pulpwood export embargoes, the threat of depletion of United States forests, and United States publishers' desires for an alternative newsprint source—had a bearing on, and in fact were interrelated in bringing about, the United States tariff action. If it was feared that the United States forest situation was deteriorating, it is conceivable that, aware of these fears, Canadian provincial authorities sought to hasten a freeing of pulp and paper imports by the United States by means of the pulpwood export embargoes. Similarly, if United States publishers felt that United States forests were threatened with depletion, they might press for free entry for Canadian newsprint, knowing that an expansion of pulpwood imports from Canada was doubtful in view of provincial attitudes.

In regard to pulpwood exports embargoes, however, it is said that the various provincial statutes were designed to protect the Canadian forests rather than to induce free entry for Canadian pulp products into the United States.² This latter may have been little more than a fortunate by-product. As was noted, rising United States pulpwood consumption suggests no real threat of forest depletion in that country. If this is true, the Canadian embargoes might merely have transferred pulpwood logging back to the United States. Provincial policies motivated by desires to force the United States to accept Canadian pulp and paper would have been risky indeed against a background of ample United States forest resources.³ Conversely, conservation or protection of Canadian forests seems a stronger motivation behind the provincial embargoes.⁴ As things had stood, it was altogether too easy for United States paper concerns to log indiscriminately in Canada, where they had no large investments to protect.

The third explanation for the United States tariff elimination—that United States publishers were seeking to broaden their supply base—seems

²Without detailed historical data, which are not available, it is difficult to judge how important the embargoes were to the United States paper industry's supply picture. One piece of evidence is given in *Print Paper Pendulum* (L. E. Ellis, Rutgers University Press, 1948). Of all the provincial embargoes, Quebec's was of most importance, but Professor Ellis states (p. 75): "The impression gained ground in some American governmental circles that the Canadian prohibitions were not, after all, likely to be of great influence, since it was estimated that only about 15% of the Quebec pulpwood cut came from Crown lands".

³The idea of pulpwood export embargoes as a means of freeing United States pulp and paper imports makes very little sense as applied to Ontario and British Columbia. The forest resources of the United States upper midwest and west coast were certainly ample at the time (1900-1913).

⁴The first National Forestry Conference was held in Canada in 1904 with conservation as one of its main themes. This is evidence of a growing concern for the protection of our forests at this time.

the most unqualified. It is substantiated by the way free entry was granted: first to newsprint alone (and only to Canada), with pulps added two years later. It is further suggested by the background of events surrounding United States newsprint production and consumption and going back many years: since before the turn of the century United States publishers had been restive under sole reliance upon United States mills for their supplies. In close conjunction with the periods of tight newsprint supply, the publishers had for years cried out against alleged United States manufacturers' combinations or collusion, and there had been a series of Congressional and governmental investigations.⁵ The detailed history of the years 1900-10 records the steady build-up of indignation and pressure for action.

One is led to conclude that the arguments based on depletion and the pulpwood embargo reinforced the attempt to gain free entry for newsprint, but the action of the powerful and vigorous publisher groups appears to have been the main cause of the tariff elimination. Thus, at best, it might be argued that the provincial pulpwood embargo legislation was successful in forcing the United States to upgrade its imports (if indeed this was the purpose) only because other more powerful factors were operating in the same direction.

This has been a lengthy digression from the outline of pulp and paper growth in Canada. In this outline the impact of the United States tariff action was seen in Table 26, which compared the industry of 1920 with that of 1900. The year 1911 began a third phase of industry development—a phase which ended in the bitter disillusionments of 1929-33.

The period 1921 to 1929 continued the rapid growth that had begun ten years earlier. The number of mills did not increase significantly: there were 108 in 1929 as against 100 in 1920. The number of employees increased only 10%, to about 34,000. But capital employed went from \$348 million to \$645 million, and this indicated the nature of the growth. The typical mill became much larger and more productive; and, though it may have seemed quite incidental, the relative growth of the capital factor also brought new elements of rigidity in cost structures.

Production increased rapidly, but almost all the expansive force was directed toward newsprint. Wood-pulp exports were virtually the same in 1921 and 1929: 820,000 and 831,000 tons. Production of all grades of paper and paperboard excluding newsprint went from 339,000 tons to 472,000 tons. This gain, while proportionately sizable, was not of major importance in tonnage. Newsprint production, however, which had been negligible in 1900 and had reached 876,000 tons in 1920, soared to almost 2½ million tons in 1929.

4. Depression and Recovery: 1929-45

The events of 1929 and the ensuing years do not rank as revolutionary in the foregoing sense, but, as for most forms of economic activity, they marked the cessation for many years of the rapid growth which the industry had enjoyed since 1911. It was not that the demand for the industry's products fell off unduly during the depression: at the 1929 peak, production had reached 4,027,000 tons of newsprint, paper of other grades and exports of wood pulp, and by 1933 the total was down only about 25% to 3,027,000 tons. Granted, of course, that this was a serious decline, it was nevertheless much smaller than in many other lines: between 1929 and 1933, for example, asbestos fell 60% in production, cement 80%, rubber 45% and steel 75%. Moreover, by 1939 pulp and paper output reached a level of just over 4.5 million tons, about 12.5 percent ahead of the output of 1929. Yet the industry suffered heavy losses, and there were extensive bankruptcies and re-organizations throughout this period.

The newsprint sector of the industry best illustrates the difficulties which the industry experienced. In that sector more than one-half of productive capacity went into receivership as the depression progressed, and the last company did not re-emerge until 1946. A study of the financial reports of nine major newsprint producers, beginning with the year 1933, discloses consistent losses each year from 1933 to 1938, with the exception of 1937. In that year, the net profits of the companies attained an average just over 1% of their net worth; in each of the other years the loss ratios ranged from about 1.75% to 0.75% of net worth.

In retrospect, it now seems evident that the special difficulties encountered by the newsprint companies during the depression had their origin in over-expansion during the late 1920's. This is best illustrated by data on newsprint capacity, production and prices during the 1925-35 decade. These are shown in Table 27.

Table 27

CANADIAN NEWSPRINT CAPACITY AND PRODUCTION AND NEWSPRINT PRICE INDEXES, 1925-35

Year	Capacity (thousands of tons)	Production (thousands of tons)	Operating ratio	Price indexes 1935-39 = 100
1925.....	1,823	1,619	88.8	n.a.
1926.....	2,121	2,068	97.5	169.8
1927.....	2,716	2,290	84.3	169.8
1928.....	3,262	2,612	80.1	165.9
1929.....	3,512	2,984	85.0	144.1
1930.....	3,902	2,791	71.5	144.1
1931.....	4,127	2,516	61.0	131.1
1932.....	4,142	2,186	52.8	113.4
1933.....	4,149	2,282	55.0	89.3
1934.....	4,182	2,911	69.6	86.8
1935.....	4,263	3,083	72.3	86.7 ^a

^a Depression low point.

SOURCE: Newsprint Association of Canada and Dominion Bureau of Statistics.

It is significant that the operating ratios and prices were already falling in the late 1920's even while production continued to rise quite rapidly through to 1929. The fact is that capacity was increasing even more rapidly in this period and, because projects underway could not be abandoned, continued to increase rapidly until 1931. To an industry requiring heavy capital investments, and financing an important part of its expansion by debt capital (as it then was), the over-expansion of the 1920's meant weakness and the decline of demand in the early 1930's meant disaster. Though production fell between 1929 and 1932 only some 27%, the capacity increase left almost one-half of the industry's capacity idle by the latter year.

As shown in Table 27, newsprint prices declined consistently from 1927 to 1935. Much the same trend was experienced with wood pulp. Table 28 illustrates price trends from the pre-depression peak to the depression low point. This evidence indicates that for newsprint and wood pulp—the two major sectors of the industry—price declines were more severe and persisted longer than for many commodities and sectors of the economy. Since production in the pulp and paper industry was relatively well maintained through these years, it would seem that the industry's special difficulties resulted primarily from extraordinary price weakness coupled, as was mentioned, with heavy financial commitments associated with the expansion of the 1920's.

Table 28

PRICE INDEXES IN CANADA, PRE-DEPRESSION PEAK TO DEPRESSION LOW-POINTS

	Peak		Low		Percent change
	Year	Index	Year	Index	
Newsprint.....	1927	169.8	1935	86.7	-48.9
Wood pulp.....	1926	139.4	1936	93.1	-33.2
Asbestos.....	1929	130.8	1932	86.6	-33.8
Cement.....	1929	97.2	1933	102.3	+ 5.2
Steel ^a	1926	101.5	1931	92.0	- 9.4
Wholesale prices.....	1926	130.3	1932	86.9	-33.3
Industrial materials.....	1926	144.3	1932	74.2	-48.6
Raw and partly manufactured goods.....	1926	129.1	1932	75.5	-41.5
Fully and chiefly manufactured goods.....	1926	133.0	1932	92.8	-30.2

^a Rolling mill products.

SOURCE: *Canadian Statistical Review*, 1955 supplement, Dominion Bureau of Statistics.

With the onset of World War II, the demand for pulp and paper products as a whole increased. While production of all grades of pulp had averaged roughly 4.25 million tons annually during 1935-39, the total reached 5.7 million tons by 1941. Thereafter, it declined slightly as shortages of manpower, wood supplies and electrical power cut into the sustainable level of operations, and by 1944 total production was reduced to just under 5.3 million tons annually. Wartime demands for pulp and paper products and the shortages just mentioned were, however, uneven in their effects upon the industry's output.

It will be seen from Table 29 that the second and third commodity groups expanded considerably during wartime. These pulp and paper grades went into products with a high wartime essentiality—wrapping and packaging papers and paperboard, for example—and they also, in the case of pulp exports, went to markets which had lost their Scandinavian sources of supply in the wartime disruption of that trade. For newsprint the case was somewhat different. Its wartime function was clear enough: the importance of the news and information services of the press were recognized. Moreover, for Canada, this major source of United States dollars was an important offset to our large-scale imports of defence supplies. But, in wartime, newsprint consumption could be restricted in a way which nitrating pulp, to take an extreme example, could not. The war programme created an increasing demand for most pulp and paper products; but for newsprint, while it was essential that the flow of tonnage to markets be maintained, there was not this same pressure to increase tonnage. Consequently, the effects of manpower and electric power shortages were allowed to fall mainly on newsprint production.

Table 29

PREWAR AND WARTIME PULP AND PAPER PRODUCTION TRENDS

Products	1935-39		1942-44	
	Thousands of tons	Percentage of total	Thousands of tons	Percentage of total
Newsprint	3,337	71.8	3,313	57.4
Other paper and paperboard	604	13.0	968	16.8
Pulp exports	709	15.2	1,492	25.8
Total outputa	4,650	100	5,773	100

a These data are not comparable with the figures cited in the text immediately preceding, which referred only to wood pulp production. The output of newsprint, other paper and paperboard, and wood pulp exports in 1941 totalled almost 6.2 million tons.

This fourth phase of the industry's development, which had begun in 1929, might be said to have closed with the end of the war. Enough has been said to indicate that the 15 years prior to 1945 had been years of difficulty: there had first been a market decline which, although alone it need not have been serious, had been accompanied by over-expanded capacity and over-extended financial commitments. Recovery in the newsprint sector had been interrupted by the war: production had reached 80% of capacity in 1941 then had fallen back (owing to the shortages mentioned) to about 69% in 1943 and 1944. Moreover, it will be recalled that pulp and newsprint prices had suffered acute and prolonged weakness in the '30's; during the war, price control had limited the extent to which these prices could respond to stronger markets.

In all, the industry emerged from the war still weakened by its depression experience. Its earlier spectacular growth had made it a speculative favourite

in the 1920's; now it had a 15-year record of over-expansion or—to state the same thing in reverse—of much more modest growth in its markets. Its earnings through this latter period had been modest. There would now be hesitancy on the part of investors; the optimism of its management had been replaced by pessimism or, at least, by caution.

5. Postwar Development: 1945 to the Present

This was the position when the postwar growth phase began—a phase which has lasted virtually without interruption to the present. This latest phase of industry expansion is illustrated in Table 30, which shows the output in 1945 and as estimated in 1955.

Table 30

CANADIAN PULP AND PAPER OUTPUT, 1945 AND 1955 (ESTIMATED), BY MAIN GRADES

	1945 (thousands of tons)	1955 (thousands of tons)	Percentage increase
Newsprint.....	3,592	6,191	72
Book, writing and fine papers.....	162	321	98
Wrapping paper.....	162	258	59
Paperboard.....	541	788	46
All other.....	170	400	135
Pulp exports.....	1,454	2,419	66
Total.....	6,081	10,377	71

SOURCE: 1945: Dominion Bureau of Statistics, 1955: Canadian Pulp and Paper Association.

In effect, this postwar growth reflects general economic development both here and abroad; but it does more than this, since the major segment, newsprint, started from a somewhat depressed base in 1945. The growth of individual industry sectors will be dealt with in greater detail in following sections and so will not be reviewed here. First, however, the status to which this postwar expansion has brought the industry and its segments may be outlined briefly.

In our Canadian economy, the manufacture of pulp and paper is our largest industrial enterprise. Moreover, in a country where external trade is vital to the maintenance and raising of living standards and welfare, the industry's products make an especially important contribution: pulp and paper exports account for 24% of the total value of our exports to all countries and 33% of our exports to the United States. Finally, in those products in which it has been possible to develop international trade without tariff restrictions—newsprint and pulp—the industry is in a leading position among world producers.

Canadian newsprint production in 1954 totalled almost six million tons. This was about 60% of the total end-product production of the industry; it

was five times as great as the newsprint production of its nearest rival, the United States industry. In terms of markets, about 7% of shipments went to domestic consumers; almost 82% went to the United States market, and the remaining 11% was exported to about 65 other countries.

Market wood pulp,⁶ second largest product by volume, accounted for more than 22% of production in 1954. Canadian production and exports of chemical pulps have expanded greatly in recent years, bringing Canada to a leading position in this field. Currently, some 98% of the world's pulp exports come from six countries: Sweden, Norway, Finland, Austria, the United States and Canada. Of these, Canada and Sweden have shared the lead in recent years, each accounting for about 30% of the total. By way of comparison, in 1938 our exports made up only 11% of the world total, and our tonnage was just over one-quarter as large as that of Sweden. In distribution, of the 2,172,000 tons of pulps exported in 1954, almost 77% went to the United States, the remaining 23% going to 34 countries overseas.

The remainder of the industry's products—almost one-fifth of its end-product output—is made up of a wide range of papers and paperboards. These products are generally protected throughout the world by substantial tariff barriers, and therefore these segments of the industry are primarily engaged in supplying domestic markets. Exports are relatively small and tend to vary from year to year. By main groups these are accounted for in the following paragraphs.

Paperboards, including building boards and building papers, totalled just over one million tons in 1954 and just over 10% of the total production of 1954. About 60,000 tons, or less than 6%, were exported, mostly to the United States and the United Kingdom.

Book, writing and groundwood papers made up 2.7% of production with a total of about 260,000 tons in 1954. Roughly one-fifth of this output was exported, primarily to markets in the United States, the Union of South Africa and South America, and most of these exports were groundwood grades shipped to the United States.

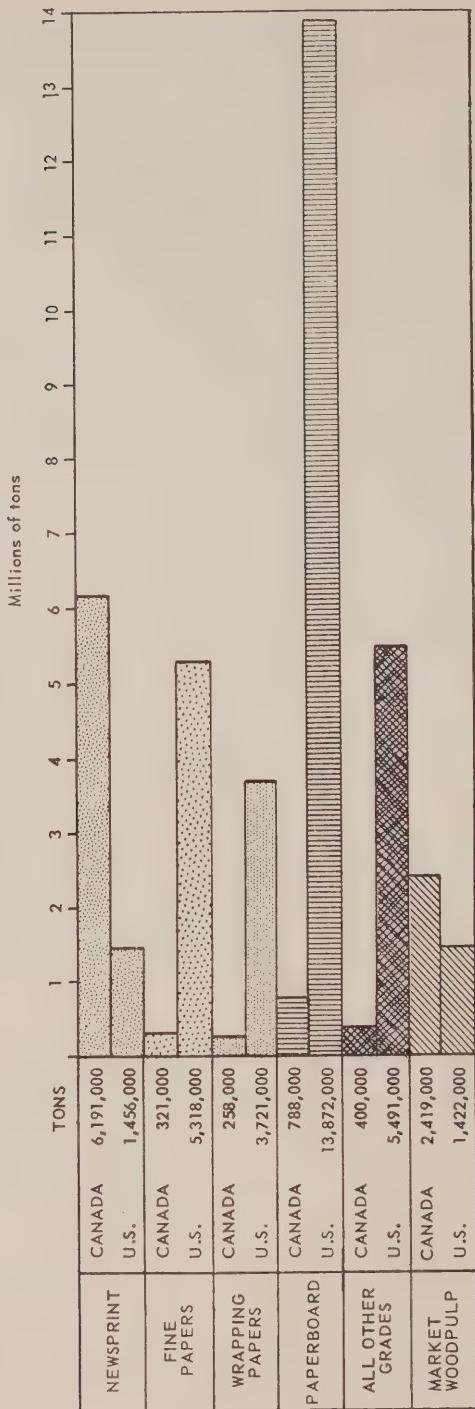
Wrapping paper production totalled 250,000 tons, just over 2.5% of 1954 industry output. Only about 2% of output was exported, the United States and some Commonwealth countries providing the main markets.

Tissue, sanitary and specialty paper production totalled almost 190,000 tons, equal to just under 2% of output. Virtually all of this production went to supply domestic needs.

It is of interest, finally, to compare the Canadian industry of today—with respect both to its size and to its grade structure—with its counterpart in the United States. This is done in Figure 18 and Table 31.

⁶As here used, the term "market wood pulp" means the sum of paper-pulp export plus dissolving pulp production. A considerable tonnage of paper-pulp is marketed in Canada for domestic use, but this is excluded since it is reflected in the production of paper and other products in Canada.

COMPARATIVE NORTH AMERICAN PULP AND PAPER OUTPUT, 1955



Sources: CANADA - CPPA and NAC
U.S. - Bureau of the Census
American Pulp and Paper Association
Monthly Statistical Review, March 1956

Figure 18

Table 31

**COMPARATIVE STRUCTURE OF U.S. AND CANADIAN
PULP AND PAPER INDUSTRIES, 1955 (ESTIMATED)**

	Canada		U.S.	
	Thousands of tons	Percentage	Thousands of tons	Percentage
Newsprint	6,191	59.7	1,456	4.7
Fine papers	321	3.1	5,318	17.0
Wrapping papers	258	2.5	3,721	11.9
Paperboard	788	7.6	13,872	44.3
All other grades	400	3.8	5,491	17.6
Wood pulp ^a	2,419	23.3	1,422	4.5
Total	10,377	100.0	31,280	100.0

a Includes non-paper (dissolving) pulp production and paper-pulp exports from the two countries: i.e., paper-pulp used or sold within the country of origin is excluded.

SOURCES: Canada—Canadian Pulp and Paper Association and Newsprint Association of Canada. U.S. Bureau of the Census; *Monthly Statistical Review*, American Pulp and Paper Association, March 1956.

Thus, in 1955, the end-product output of the United States pulp and paper industry was about three times that of Canada,⁷ but the grade distribution of production is of particular note.

The Canadian industry specialized in newsprint and market wood pulp, producing relatively smaller tonnages of the other grades (which meet external trade barriers). In the United States the pattern is the opposite: production is largest in the protected grades. It should also be mentioned that the particular suitability of southern pulpwood to the manufacture of paperboard—plus, of course, the huge domestic market potential—induced the notable expansion in paperboard production. But, in general, Figure 18 brings out the distorting effects of world tariff barriers on Canada's pulp and paper output.

From this outline of the development of the industry we can now proceed with a more detailed analysis of its long-term growth prospects. As to procedure, we shall use the present over-all product structure as the basis for dividing the subject. Thus newsprint and pulps, the two largest tonnage items, both of which enter largely into export trade, will be considered separately. The third section, dealing with other papers and paperboard, will include those grades listed last in this section. Somewhat smaller in tonnage, though still large in the aggregate, they have the common characteristic of heavy reliance upon the domestic market.

⁷In 1955, the United States imported roughly 1.8 million tons of wood pulp from Canada. Additionally, the United States industry used close to nine million tons of wastepaper, primarily in the manufacture of paperboard (the Canadian industry used about 375,000 tons). In terms of wood pulp only, the United States industry produced in 1955 just under 21 million tons of all grades, while Canadian industry output totalled 10 million tons.

Newspaper**1. Features of the Market**

The preceding section has indicated the major position which newspaper occupies in the product structure of the Canadian pulp and paper industry. We have also seen something of the predominance of Canadian newspaper in the world picture. Both of these features have a bearing on the outlook for the industry in the years ahead, for both suggest what is actually the case—that we in Canada are specialists in the production and distribution of newspaper.

Out of this specialization has come the development of the productive skills and the commercial knowledge which are the prerequisites of successful large-scale operations. All this is not to say that the Canadian mills shall have automatically or by right a major share of future world requirements. But it is to say that the industry is starting this next quarter century from a position of strength arising from its proven technical efficiency and established trading relationships. In this section it is proposed to consider what, in fact, the long-range demand prospects for newspaper appear to be and, in particular, what proportion of that demand might be directed toward the Canadian industry.

At the outset it will be helpful to set forth in somewhat more detail the main features of the world newspaper market as it has developed over the years and as it exists now. Table 32 summarizes the main trends by half decades for the period 1925-54.

Table 32**WORLD NEWSPRINT CONSUMPTION^a AND SUPPLY FROM CANADA, BY HALF-DECades, 1925-54**

Years	Consumption			Supply from Canada	
	World total Thousands of tons	United States Thousands of tons	Percentage	Thousands of tons	Percentage of world supply
1925-29	6,414	3,439	53.6	2,306	36.0
1930-34	6,753	3,095	45.8	2,531	37.5
1935-39	8,159	3,561	43.6	3,316	40.6
1940-44	5,892	3,669	62.3	3,528	59.9
1945-49	7,673	4,640	60.5	4,611	60.1
1950-54	10,868	6,041	55.6	5,637	51.9

^a Actual consumption data are not available for the United States. For other countries, figures for "supply taken" are used. These will differ from consumption owing to variations in consumers' stocks.

SOURCE: Newspaper Association of Canada.

Between the periods 1925-29 and 1950-54 world newspaper consumption and demand increased by almost 4.5 million tons or 69%. Since both of these half-decades were periods of general prosperity, this increase can be said to give a fairly true measure of the trend of growth throughout the over-all

period. The table also brings out the relative growth of Canada as the major world supplier: in 1950-54 Canada supplied on the average almost 52% of the world's needs, as against 36% in 1925-29. These percentages reached a peak during and after the war, but it should be mentioned that this came about not only through the expansion of Canadian shipments but also through greatly reduced production in overseas countries, particularly in Europe, due to wartime destruction and dislocation.

Table 32 shows the predominant position of the United States as a market for newsprint. It had already occupied this leading position by 1925-29 and, in fact, the proportion was declining in the prewar period. Severe wartime curtailment overseas reversed the trend. Since the war, overseas recovery has again reduced the United States proportion despite the very rapid postwar growth of American consumption.

Table 33

WORLD NEWSPRINT DATA, 1955 (ESTIMATED)

Production	Thousands of tons	Percentage	Supply to	Thousands of tons	Percentage
Canada.....	6,180		U.S.	6,420	
U.S.	1,500		Britain....	1,024	
Britain....	694		France....	505	
Finland....	602		Japan....	492	
Japan....	499		Canada....	430	
France....	427		Germany FR ..	405	
Sweden....	386		Australia....	290	
Germany FR ..	265		Sweden....	178	
Norway....	175		Italy....	177	
Italy....	155		Brazil....	158	
Austria....	128		Argentina....	125	
Netherlands....	117		Netherlands....	122	
12.....	11,128	88	12.....	10,326	82
16 Others....	405	3	85 Others....	1,221	10
Russian bloc and China..	1,077	9	Russian bloc and China..	1,052	8
Total.....	12,610	100	Total.....	12,599	100
Exports	Thousands of tons	Percentage	Imports	Thousands of tons	Percentage
Canada.....	5,750		U.S.	5,150	
Finland....	539		Britain....	475	
U.S.	230		Australia....	207	
Sweden....	208		Germany FR ..	140	
Britain....	145		Brazil....	118	
Norway....	134		Argentina....	105	
Austria....	94		France....	100	
7.....	7,100	98	7.....	6,295	87
8 Others....	83	1	85 Others....	903	12
Russian bloc and China..	105	1	Russian bloc and China..	80	1
Total.....	7,288	100	Total.....	7,278	100

SOURCE: Newsprint Association of Canada.

The current structure of the world newsprint market is shown in Table 33. The left side of the table again shows Canada's leading position as a

producer and also her predominant position in export markets. As has been mentioned, by far the great bulk of Canada's export tonnage goes to the United States; but even if this tonnage is excluded, the remainder, 725,000 tons in 1955, makes Canada the leading exporter to other world markets. On the right side of the table, the matching importance of the United States in consumption and imports stands out. It is interesting to note too, that the 12 leading producers and the 12 leading consumers, as measured by supply taken, account for more than 80% in their respective categories. If the two lists are combined, 15 countries account for more than four-fifths of all newsprint trade.

From these two tables the first outline of the world newsprint market emerges. It is the picture of a commodity for which demand and supply have been rising and continue to rise without apparent abatement; which is produced in appreciable quantity in only a few countries, with Canada far in the lead, and which is consumed largely in most of these same countries, with the United States overshadowing all others.

The volume of newsprint consumed per capita in a country generally reflects the degree of economic development in that country. Using per capita national income data (expressed in 1949 United States dollars) as the measure of economic development, the Food and Agriculture Organization, in a recent publication, found a high degree of correlation for a 31-country sample in which the income data ranged from a low of \$50 a person to \$1,450, and per capita newsprint consumption from 0.13 pounds to 74.95 pounds.⁸ This relationship between per capita income and newsprint consumption in 31 countries is shown in Figure 19. A simple mathematical correlation probably states the relationship too rigorously, but it is undoubtedly true that newsprint consumption is determined to a major degree by the level of living standards which has been achieved.

This relationship is reflected in United States newsprint use: the high level of newsprint consumption per capita ranks well above all others as does the economic standard, as measured by income, enjoyed by its citizens. This high level of consumption, combined with a relatively large population, gives to the United States its leading position in the world newsprint picture.

By reason of size alone, the United States market deserves particular attention in any consideration of the global newsprint outlook. In addition, the American market receives more than three-quarters of its supply from Canada and in doing so takes 80% of our output. In this close relationship or interdependence there is further reason for giving first and detailed analysis to the United States newsprint outlook.

⁸These findings are published in *Possibilities for the Development of Pulp and Paper Industry in Latin America* (Food and Agriculture Organization and Economic Commission for Latin America, New York, 1954, p. 130). The index of correlation was 0.91.

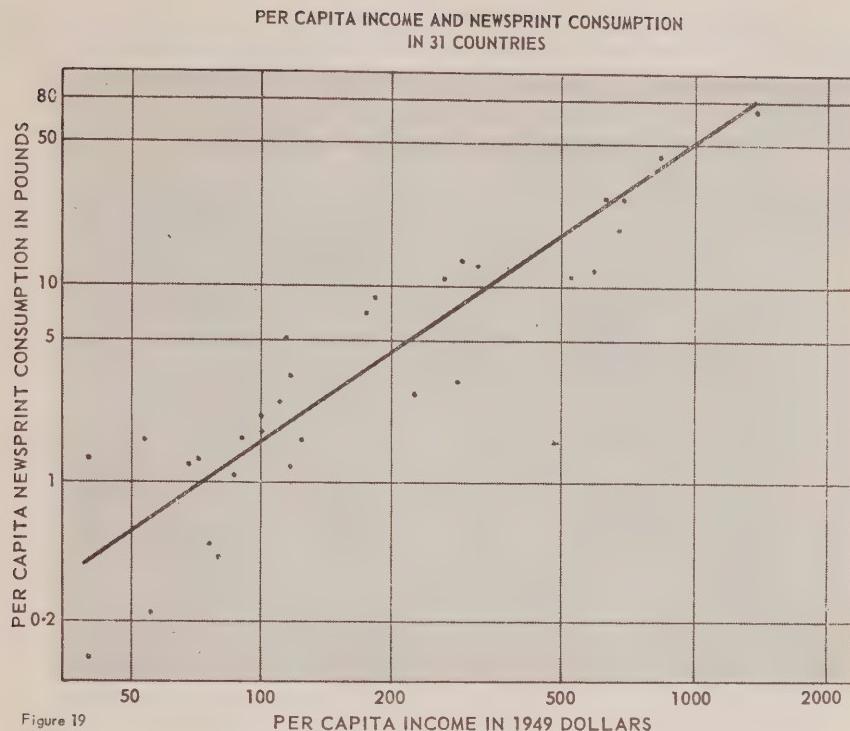


Figure 19

2. *The Outlook for Newsprint Demand in the United States*

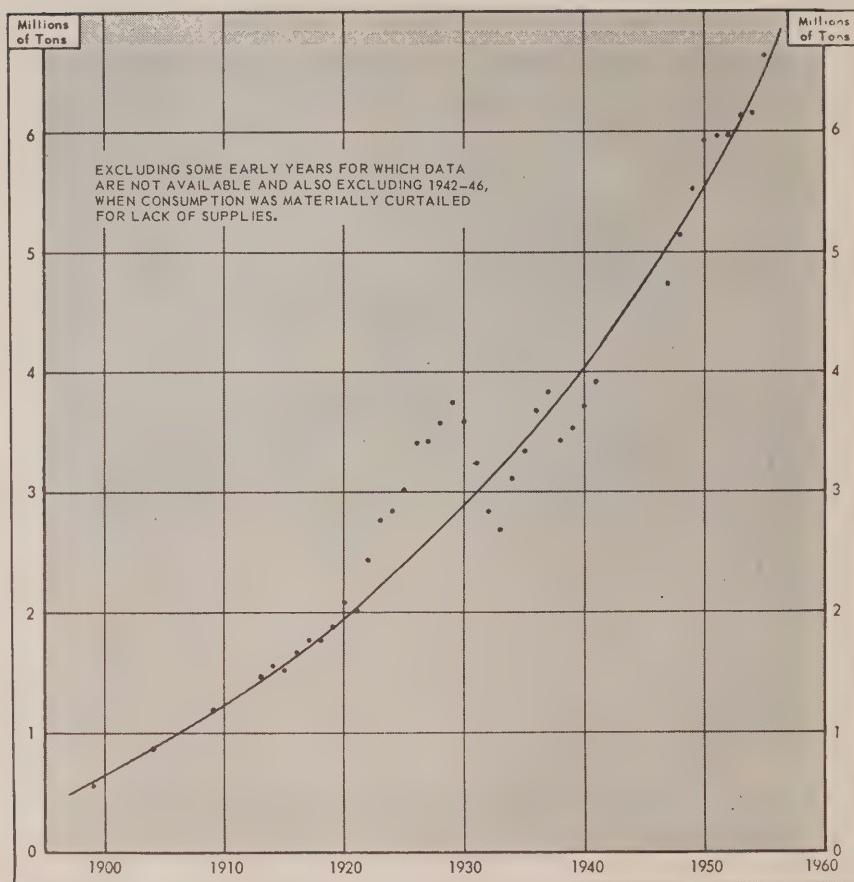
Figure 20 shows United States newsprint consumption data for the early years for which estimates are available and annually from 1913 to date. It will be seen that the data fit well a trend line which is rising by increasing amounts, in terms of average annual increases, for each passing year. This trend line suggests that newsprint consumption in the United States has been accelerating.

The central question in this phase of the analysis concerns what shape this trend line is likely to take in the future. If, for example, the historical trend is simply projected, it yields the astonishing figure of 14 million tons for 1980. Do we, in fact, face such an exciting, if perhaps ultimately embarrassing, prospect?

It would be fair to say of the historical trend of growth that it has been the product of a great many factors and of certain special influences which these factors, singly or in changing combination, exerted upon the development of the United States newsprint industry and so upon newsprint consumption. A simple projection of the trend line embodies the assumptions that these historical factors will continue to be present, that their future

courses will not deviate from those of the past and that the influences of all these factors on newsprint demand will not change. There can be little doubt that these assumptions, however tempting, cannot be made.

U.S. NEWSPRINT CONSUMPTION, 1899-1955



Newspaper Association of Canada

Figure 20

Future requirements of United States newsprint

The end uses of newsprint may be classed under three headings, as follows:

Consumption by:

- U.S. daily and Sunday newspapers 93.5%
- U.S. weekly newspapers 1.5%
- Other users 5.0%

Because only fragmentary information is available on newsprint consumption by weekly newspapers and other users, these figures are approximate. They are, however, sufficiently indicative of over-all market proportions to suggest the needlessness, even if sufficient detail were available, of any analysis of the last two use categories. We will accordingly concentrate on daily and Sunday newspaper trends, treating these as determining the total requirements of the market. The procedure to be followed thus contains the implicit assumption that the trend of use in the two minor categories will not vary from the above proportions.

In regard to the demand outlook for the United States daily and Sunday press, there are again three factors to consider: (a) the number of copies which will be printed (as measured by circulations); (b) the average number of pages which will be printed; and (c) the average size of pages. Each of these may be considered as a dimension in determining newsprint requirements; for any newspaper, and for the aggregate, newsprint consumed will be the product of copies printed times average paging times size of page.

The last of these factors may be disposed of quickly. Variation in the size of page will be a minor element in the determination of future United States newsprint requirements, as it has been in the past. Through the years there has been something of a tendency toward narrower pages, but changes have taken place sporadically, followed by a gradual adoption throughout the industry. There is thus little basis for projecting a trend toward still narrower sizes. We will simply assume that this dimension will not change: any other assumption would be purely arbitrary. Provided there are no revolutionary changes in newspaper formats, the feasible extent of changes in this factor might influence the estimates by 5% at the most.

Two factors, then, remain as the constituent elements in the determination of future United States newsprint needs: the number of copies printed, which is a function of circulation demand, and the number of pages printed, which is influenced primarily by the volume of advertising demand. The latter is not strictly true: it does not follow that changes in advertising will bring about a completely predictable change in paging. At the present time, United States newspapers devote on the average about 60% of page space to advertising and 40% to editorial matter (i.e. lineage not paid for). These proportions can be varied to permit changes in advertising (or editorial) matter without changes in paging, but for present purposes we will simply regard advertising as the determinant of paging.

Superficially these two factors appear to be responsive, in turn, to other separate factors: circulation demand to adult population trends⁹ and advertising demands to levels of income and business development.

⁹In the United States, circulation demand does not appear to be particularly responsive to changes in the levels of incomes nor to changes in newspaper prices. This income and price inelasticity of circulation demand is attributable to the high level of United States incomes and the low costs of newspapers. Newspapers are a minor element in consumers' budgets. There is some evidence that a price increase by a particular paper will be followed by a short-term circulation loss. But in the long-term, and where the price increases are general, circulation losses appear to be negligible.

In fact, however, there is some evidence that the two factors are not entirely separate. This evidence is seen in the declining trends in daily and Sunday circulation per adult noticed since 1945 and 1948, respectively: for dailies there has been a decline of 4% and for Sunday papers a decline of 6.3%. Pages printed have meanwhile increased by 65% since 1945 for dailies and by 20% since 1948 for Sunday papers. The circulation declines cannot be attributed to declining general economic activity, as was true in 1929 and 1938. Nor were rising newspaper prices a probable cause: though some newspapers have suffered temporary circulation losses after price increases, these have generally been made up. Moreover, such information as is available indicates that newspaper prices have not risen over the years in relation to general price trends.

It appears, rather, that there is a limit, on the average, to the number of pages an individual subscriber will take time for. United States newspapers are purchased at the rate of one daily paper and one Sunday newspaper for every two adults. This is equivalent to more than one copy of each per family. It means that when rural areas not serviced by daily or Sunday papers are taken into account, copies per family in many instances are much higher. The evidence suggests that, as paging increases, these readers, faced with a growing list of competitive uses for their leisure time, have reduced their purchases of two or three daily and Sunday papers to one or two. Although there are undoubtedly varying regional or local trends—suburban newspapers have enjoyed rapid circulation gains—the net effect of the reductions, occurring probably largely in metropolitan areas, is reflected in the declines that have taken place in recent years in the national averages for daily and Sunday copies per adult.

Briefly then, although aggregate newspaper circulations have increased steadily, there has been a decline in the circulation dimension on a per adult basis; and this appears to have been due to the growth in advertising as reflected in the paging dimension. It must be emphasized that this analysis of United States publishing trends rests largely on theory and on general inferences. There have not been sufficient statistics available since the depression of the '30's and the dislocation of the war years to provide a fully reliable basis for calculation of the trend of this relationship between circulation growth and advertising growth, as applied to present high levels of newsprint usage in the United States. But the statistics of the last ten years do give some confirmation of the theory and do indicate that newsprint consumption in the United States is not growing at a rate based on a simple multiplication of circulation and advertising growth factors.

For this Commission's purposes, however, there remains the question, *What does the future outlook for United States newsprint consumption appear to be?* An index of "page circulation per adult" was prepared for the years 1945 to 1954. This index combines the two dimensions of circulation and

the number of pages printed, the latter reflecting the volume of advertising. It was calculated by multiplying the weekly average number of pages printed in each year in both daily and Sunday newspapers by the total number of copies printed and thus obtaining the annual weekly average of pages sold. This result was divided by the total adult population in each year, and the resulting figures were reduced to index numbers, the number corresponding to 1950 being 100, as shown in Table 34.

Table 34

INDEX OF U.S. PAGE CIRCULATION PER ADULT

1945.....	62.5	1950.....	100.0
1946.....	75.1	1951.....	99.6
1947.....	81.9	1952.....	99.8
1948.....	89.9	1953.....	102.4
1949.....	94.7	1954.....	100.8

Admittedly there were special influences at work during the past decade. The rapid rise in the index between 1945 and 1950 reflects the postwar recovery of newsprint consumption from its depressed wartime levels. The fairly constant level between 1950 and 1954 may have been to some extent the result of the novelty impact of television in this period, and we can reasonably expect a renewed upward trend in the index in the next 25 years, although the rate of gain is likely to decrease. It is apparent, however, that during the last five years the interaction of page increases on circulation has been as already indicated: while the number of pages has risen, per adult circulations have fallen.

In spite of all the limitations of an index based on so short a period and subjected to special influences, the index of page circulation per adult gives a trend which can be projected to 1980 and which, when combined with the index of adult population, provides a measure of United States newsprint requirements at 5-year intervals, as shown in Table 35

Table 35

PROSPECTIVE U.S. NEWSPRINT REQUIREMENTS

Year	Page circulation units - aggregate	P C Index	Newsprint requirements (thousands of tons)	
			Calculated	Rounded
1950.....	16.84 ^a	100.0	5,937 ^a	5,937 ^a
1955.....	18.74	111.3	6,607	6,600
1960.....	20.39	121.1	7,189	7,200
1965.....	22.22	131.9	7,831	7,850
1970.....	24.50	145.5	8,638	8,650
1975.....	26.99	160.3	9,517	9,500
1980.....	29.60	175.8	10,437	10,450

^a Actual.

These projections are compared with other long-range forecasts of United States demand prospects in Table 36.

Table 36

LONG-TERM PROJECTIONS OF U.S. NEWSPRINT REQUIREMENTS

(thousands of tons)

Year	Paley ^a	Weyerhaeuser ^b	ANPA ^c	Forest Serviced	UNESCO ^e
1960.....	7,200	—	6,700	7,500	—
1965.....	7,850	—	7,300	—	7,975
1970.....	8,650	—	7,900	—	—
1975.....	9,500	8,700	8,600	—	—
1980.....	10,450	—	—	9,300	—

^a President's Materials Policy Commission, Washington, June 1952.

^b *America's Demand for Wood, 1929-1975* (Stanford Research Institute), Weyerhaeuser Timber Co., Tacoma, Wash., 1954.

^c *Newsprint Now and in the Next Decade*, American Newspaper Publishers Association, New York, October 1951.

^d *Timber Resource Review*, U.S. Forest Service, Washington, September 1955.

^e *Paper for Printing and Writing, Tentative Forecasts of Demand in 1955, 1960 and 1965* (intelligence unit of the *Economist*, London), published by UNESCO, Paris, April 1954.

3. The Outlook for Newsprint Demand in Canada

In analysing and projecting newsprint demand trends in the United States, it was possible to go into considerable detail. There is available a wealth of historical information concerning the nature, structure and growth of the United States press. The subject could be divided into its main components in order to analyse separately the factors which have produced the newsprint consumption trends. Moreover, it was desirable that the United States market be analysed carefully because of its size and therefore because of its importance in determining the world projections.

The analysis of the Canadian newsprint market can, and must, proceed differently. We shift now to a market in which current newsprint use is roughly one-fifteenth that of the United States and which, therefore, will affect the prospective over-all demand outlook much less. Secondly, the analysis must differ from the detailed examination applied to the United States market simply for lack of data. While the growth of most Canadian industries is well documented, very little historical information is available on the press in Canada—at any rate, very little information of a kind useful here. There is, for example, a notable lack of data on advertising, one of the most important constituent elements in the determination of newsprint use.

All this, of course, is not intended to detract from the importance of Canada as a newsprint market. In 1955, despite its small population, Canada ranked fifth among all countries in total tonnage consumed and, on a per capita basis, it is surpassed in consumption only by the United States

and New Zealand. As a market, Canada has other attractive features. The greater relative stability normally associated with a domestic market makes it specially valued by Canadian producers. And it is, as will be seen, a rapidly expanding market. But the fact remains that the lack of documentation necessitates a rather superficial analysis. This defect, however, is not vital because Canada, despite its high level of consumption, accounted in 1955 for only about 3% of the world total.

Table 37 shows such historical data relating to Canadian newsprint use as are available. These consist of records of annual shipments to the market for the years 1913-55. Shipments data will differ from data on actual consumption (which are not available) in any year by the amount of variation in consumers' stocks, but these data will accurately reflect the consumption trend for longer periods, in which annual stock changes may be expected to cancel out.

Table 37

CANADIAN NEWSPRINT SUPPLY IN TOTAL AND PER CAPITA, 1913-55

Year	Total (tons)	Per capita (pounds)	Year	Total (tons)	Per capita (pounds)
1913.....	90,000	23.6	1935.....	199,689	36.8
1914.....	60,000	15.2	1936.....	194,240	35.5
			1937.....	219,553	39.8
1915.....	70,000	17.5	1938.....	159,197	28.6
1916.....	81,000	20.2	1939.....	189,482	33.6
1917.....	90,000	22.3			
1918.....	98,000	24.1	1940.....	183,854	32.3
1919.....	95,000	22.9	1941.....	196,766	34.2
			1942.....	202,536	34.8
1920.....	109,000	25.5	1943.....	192,820	32.7
1921.....	94,000	21.4	1944.....	187,227	31.3
1922.....	128,000	28.7			
1923.....	119,000	26.4	1945.....	200,249	33.2
1924.....	126,000	27.6	1946.....	247,077	40.2
			1947.....	273,485	43.6
1925.....	123,000	26.5	1948.....	304,973	47.6
1926.....	147,000	31.1	1949.....	335,385	49.9
1927.....	181,000	37.6			
1928.....	192,000	39.0	1950.....	354,602	51.7
1929.....	207,000	41.3	1951.....	359,895	51.4
			1952.....	368,768	51.1
1930.....	162,000	31.7	1953.....	398,277	53.9
1931.....	194,000	37.4	1954.....	420,896	55.4
1932.....	146,000	27.8			
1933.....	148,059	27.8	1955.....	430,444	55.2
1934.....	173,082	32.2			

SOURCE: Newsprint Association of Canada.

The pattern is not dissimilar from that of the United States. Canadian consumption increased quite rapidly up to 1929, fell during the depression years (1931 is abnormally high owing to stock accumulation) and did not fully recover before wartime supply restrictions came into force to hold consumption at just under 200,000 tons annually throughout the war. As in the

United States, the early postwar years show a spectacular upsurge as newsprint again became available. But, in contrast to the rate in the United States, the rate of growth in Canada has continued up to the present almost without abatement. This sustained growth may be attributed to the rapid rise of economy since the war.

As to over-all growth rates, it is interesting to note that Canadian consumption has increased fourfold from 1920 to date—as against a threefold gain in the United States. Between 1945 and 1955, Canada's consumption rose 115% as compared with 90% in the United States. It is, of course, also true that since the Canadian gains started from a much lower point, the proportionate increase might be expected to have been greater.

4. The Outlook for Canadian Demand

Lack of historical data changes the techniques used in projecting the demand outlook for Canada. Three methods are set out, as follows:

Simple projection of past trend

In the first method, a straight-line trend was fitted to the per capita consumption data, the years of wartime curtailment and the immediate postwar years of newsprint shortages being ignored. These years (1940-48) are omitted because they represent supply available to the markets and not the actual levels of market demand. The trend line, calculated in this way, may thus be taken as a representation of the long-term historical trend of demand. As such it provides one basis for forward projection. It yields a 1980 per capita consumption figure of 73.3 pounds and a total consumption figure, on the basis of a projected population figure of 26.65 millions, of 977,000 tons.

This projection contains the simplest of assumptions: that to date, in all years in which demands could be met, the per capita trend of growth is adequately described by a straight-line trend and that this expansion course will continue for the next 25 years.

Relationship to United States demand trend

Apart from the matter of population, it will generally be true, as noted previously, that the volume of newsprint consumed in any country is influenced by the degree of economic development in the country. This relationship is not mathematically exact, but in a surprisingly predictable way, higher levels of income or national product, expressed in per capita terms, are accompanied by higher levels of newsprint consumption. This characteristic of newsprint consumption provides a second method by which the Canadian demand trend may be calculated. The data used in this method are shown in Table 38.

Table 38

**UNITED STATES AND CANADIAN G.N.P.^a AND NEWSPRINT CONSUMPTION PER CAPITA BY HALF-DECADE AVERAGES
1930-54**

Years	Per capita G.N.P. ^a			Per capita consumption pounds		
	United States	Canada	Ratio	United States	Canada	Ratio
1930-34.....	1,049.4	688.2	65.5	49.7	31.4	63.4
1935-39.....	1,213.5	773.1	63.7	55.2	34.9	61.1
1940-44.....	1,962.5	1,204.1	61.7	55.1	33.1	60.2
1945-49.....	1,904.0	1,235.1	65.5	65.0	42.9	65.8
1950-54.....	2,006.1	1,320.2	65.9	77.5	52.7	68.0

a Both sets of G.N.P. figures are expressed in terms of 1949 Canadian dollars. Half-decade averages have been used to minimize annual irregularities.

SOURCES: United States Department of Commerce; Dominion Bureau of Statistics; Newsprint Association of Canada.

The important columns in the table are those showing the two sets of ratios. Per capita G.N.P. data for the two countries, expressed in comparable money units, are taken as representative of the levels of economic development in the two countries. Income data would have served equally well and would have produced similar results. Here the results show that Canadians apparently produce (and have available) annually a volume of goods and services equal to just under two-thirds the United States per capita volume. A very similar relationship is true of per capita newsprint consumption in the two countries. It will be noticed, too, that the two sets of ratios tended to vary together, though the newsprint ratio fluctuated through a wider range. The simple averages of the ratios are: for Gross National Product, 64.5%; for newsprint consumption, 63.7%.

The striking similarity of the ratios—and particularly of the two averages—over a period of time tends to support the correlation which the Food and Agriculture Organization and the Economic Commission for Latin America developed for a particular point of time (1949), and this “rule” may be used as a basis for calculating the Canadian demand trend.

As a result of more detailed analysis, United States newsprint consumption for 1980 was estimated at 10,450,000 tons. This is equivalent to 91.7 pounds per capita. The United States constant (1949) dollar Gross National Product may be taken as \$572.5 billion,¹⁰ equivalent to about \$2,510 per capita. For Canada, with its 1980 population estimated at 26.65 millions and its Gross National Product estimated at \$51 billion (1949 dollars), the per capita G.N.P. figure is \$1,915. This is 76% of the United States 1980 per capita G.N.P. estimate.

The application of this ratio to the 1980 United States per capita newsprint consumption figure gives an estimate for Canada of 69.7 pounds per

¹⁰Roughly based on projections made by the Paley Commission and the Stanford Research Institute.

person. This figure extended by the population estimate indicates a total 1980 demand figure for Canada of roughly 930,000 tons.

Canadian G.N.P. newsprint consumption projection

If there is a relationship between economic development in a number of countries and per capita newsprint consumption in these countries, there should be a relationship between these two things in a particular country over a period of time: as an economy develops and expands, so also should per capita newsprint consumption. While this may appear almost self-evident in theory, it is difficult to demonstrate the relationship statistically since it may, for several reasons, be distorted from year to year. If per capita G.N.P. data are used to represent economic development, it is known that the representation is far from perfect. The war years are a case in point: Gross National Product, with price changes eliminated, was increased by the production of war material which, it may be argued, was unrelated to the basic trend of economic development. Similarly, as regards newsprint consumption, it will be recalled that annual shipments data must be used to represent consumption and this has the known defect of failing to take into account annual variations in consumers' stocks.

These defects, and others which need not be mentioned here, are minimized by selecting "normal" years—that is, by eliminating the war years and immediate postwar years when newsprint consumption was restrained for lack of supplies—and also by averaging the data to eliminate inventory factors. When this is done data for the periods 1926-39 and 1950-54 remain useful. These have been averaged roughly by half-decades and are shown in Table 39.

Table 39

CANADIAN PER CAPITA G.N.P. IN CONSTANT DOLLARS
AND PER CAPITA NEWSPRINT CONSUMPTION
1926-39 TO 1950-54

Years	Per capita G.N.P. in 1949 dollars	Per capita newsprint consumption in pounds
1926-29.....	867.3	37.25
1930-34.....	688.2	31.38
1935-39.....	773.1	34.86
1950-54.....	1,320.2	52.70

A very close relationship between the two sets of data results, and it is this relationship which provides the third basis for forecasting newsprint demand. On the basis of an estimated 1980 per capita G.N.P. figure, in 1949 dollars, of \$1,915, per capita newsprint consumption would be 72.3 pounds per person. Assuming a 1980 population of 26.65 millions, total consumption would be 964,000 tons.

Summary

Each of these methods may be used to derive estimates at 5-year intervals for the period 1960 to 1980. These are shown in Table 40. The latest estimate for 1955 and the actual figure for 1950 are also shown for comparative purposes.

Table 40

PROSPECTIVE CANADIAN NEWSPRINT REQUIREMENTS^a

(thousands of tons)

Year	Method 1	Method 2	Method 3
1950.....	355	355	355
1955.....	430	430	430
1960.....	500	472	484
1965.....	598	550	575
1970.....	707	650	692
1975.....	831	770	820
1980.....	977	930	964

^a It may be recalled that, in the analyses of prospective United States requirements, a simple projection of the historical trend of consumption produced a result (14 million tons) for 1980 which appeared much too high. For Canada, a linear projection of per capita use extended by the projected population data gives a result closely similar to that of other methods. The following factors should be borne in mind, however: (1) newsprint use is currently much lower in Canada than in the United States; (2) Canada's population and output are expected to increase at a faster rate than those of the United States. Since Canada is starting the forecast period from a lower point of development, it appears not unlikely that the linear increase in newsprint use can be maintained.

The three sets of estimates are remarkably close, leaving little basis for preferring any one set to the others. However, in order to have a single set of estimates for future use, those derived by method 3 will be used hereafter.

5. *The Outlook for Newsprint Demand in the Rest of the World*

The task of forecasting demand trends for the remaining countries—which we shall simply designate “the overseas countries”—is made difficult largely by the lack of historical records. This is not uniformly true. For example, the quantity and quality of United Kingdom data are good; but, at the other extreme, there are a great many countries for which, for the prewar period particularly, only rough estimates of total annual “shipments taken” are available.

The effect of World War II complicates the projection of demand trends in the overseas countries. From about 1927 it is possible to develop overseas consumption trends from records of newsprint exports from the major producing countries. Thus there does exist a 15-year prewar record which, however faulty, provides a usable basis for projection. This record has now lengthened to 30 years, but for all but the last three or four years the records of the last half of the period have tended to distort rather than confirm the prewar trends. This is seen readily from the following:

*World newsprint supply:
Canada and the United States vs. Overseas Countries*
(millions of tons)

	1935-39	Wartime low	1955
Canada and the United States	3.8	3.4	6.9
Overseas countries	4.4	1.6	5.9

While newsprint consumption (as measured by supply) in Canada and the United States was roughly maintained throughout the war—and fell at its lowest only about 10%—for the overseas countries as a whole it fell 65%. After the war, overseas recovery to prewar consumption levels was restrained by lack of supplies resulting from losses in overseas production, by the upsurge of consumption on this continent and by the curtailed ability of these countries to buy in dollars. And when their own production came back to its 1935-39 level, as it did in 1952, exchange difficulties persisted to hamper the expansion of imports.

What is seen, then, in the foregoing summary figures is an overseas gain from the prewar period and to the present that is very moderate when compared with the growth trends on this continent. But such a comparison has little meaning unless the particularly severe wartime and postwar problems suffered by the overseas countries are taken into account. Similarly one might see in the postwar overseas consumption trend a very rapid relative rate of gain but this must be qualified by the fact that much of this gain has been recovery and not expansion. The overseas countries first exceeded their prewar consumption only in 1953.

The foregoing illustrates the very great interruption that wartime and postwar difficulties imposed upon these countries. For our purposes it greatly complicates the process of long-term projection based on historical trends. The complications cited also serve to underline the uncertainty with which any such projections must be regarded.

In our analysis we have divided the overseas countries into seven regions. These appear in Table 41. We have established historical regional demand trends using data for 1928, 1935-39 and 1955. The selection of only these particular points of time seriously limits the basis for projection, but this was done to eliminate the distortion, already outlined, that ran through most of the period between 1935-39 and the present.

For the projected years we have drawn extensively on a study¹¹ prepared for UNESCO by the *Economist* research unit. From the careful country-by-country analysis which this study contained we have been able to

¹¹*Paper for Printing and Writing, Tentative Forecasts of Demand in 1955, 1960 and 1965* (intelligence unit of the *Economist*, London), published by UNESCO, Paris, April 1954.

build up the regional demand estimates for 1960 and 1965.¹² Beyond that date, our estimates have been based on projections of the 1928-to-1965 regional trends, modified by estimated population and economic trends in the regions and the probable effects of these trends on newsprint requirements. On this basis, the regional demand estimates are as in Table 41.

Table 41

OVERSEAS NEWSPRINT DEMAND OUTLOOK, BY REGIONS

(thousands of tons)

	1955	1960	1965	1970	1975	1980
Europe.....	3,361	3,950	4,500	5,000	5,300	5,500
South America.....	459	580	750	1,000	1,400	1,900
Asia.....	909	1,200	1,550	1,950	2,450	3,200
Russia.....	600	760	1,050	1,400	1,800	2,200
Africa.....	115	150	195	245	300	360
Oceania.....	350	400	475	500	625	700
Other North American areas.....	150	210	265	330	400	475
Total.....	5,944	7,250	8,785	10,425	12,275	14,335

6. Prospective World Newsprint Demand

Having examined in detail the newsprint consumption trends for the United States, in less detail the trends for Canada, and with much less precision those for the rest of the world, we may now add these together for an estimate of global demand for the next 25 years. It is recognized that such a recapitulation adds together factors of unequal accuracy and reliability. Hence the data have been rounded in each case and in the totals in Table 42. Actual 1950 figures have been included for comparative purposes.

Table 42

PROSPECTIVE WORLD NEWSPRINT REQUIREMENTS

(thousands of tons)

Year	Canada	United States	All Others	Total
1950.....	355	5,937	3,595	9,887
1955.....	430	6,600	5,950	13,000
1960.....	485	7,200	7,250	15,000
1965.....	575	7,850	8,800	17,250
1970.....	690	8,650	10,400	19,750
1975.....	820	9,500	12,250	22,500
1980.....	965	10,450	14,350	25,750

There thus appears in prospect a total increase in newsprint requirements of almost 16 million tons or 160% between 1950 and 1980. The next question must be: *Where is this newsprint to come from?*

¹²The *Economist's* study contained actual data for 1950 and projections for 1955, 1960 and 1965. The projections for 1960 and 1965 have been modified on the basis of data provided by the Newsprint Association of Canada for 1950 and 1955 as now estimated (October, 1955).

It seems reasonable to expect that the Canadian demand will be supplied by Canadian newsprint producers. The production of newsprint to meet United States and overseas requirements, as well as its division among major producers, is much more difficult to predict, though some attempt must be made in order to judge the possible future demand on Canada for newsprint. Perhaps all that can be done is to outline the conflicting forces bearing on Canada's future share of these markets and to make some informed guesses about them.

7. Canada's Newsprint Exports to the United States

Table 43 summarizes the historical trends of United States newsprint supply by sources since 1913, and Figure 21 shows the current pattern of Canadian newsprint production and distribution of shipments.

Table 43

UNITED STATES NEWSPRINT SUPPLY BY SOURCES SELECTED YEARS 1913-55

Year	Thousands of tons from:				Percentages from:		
	Canada	United States	Europe	Total	Canada	United States	Europe
1913.....	218	1,255	0	1,473	15	85	0
1920.....	679	1,466	51	2,196	31	67	2
1930.....	2,145	1,272	134	3,551	60	36	4
1939.....	2,281	942	310	3,533	65	26	9
1945.....	2,666	707	0	3,373	79	21	0
1950.....	4,748	1,002	171	5,921	80	17	3
1955(est.)..	5,025	1,270	125	6,420	78	20	2

SOURCE: Newsprint Association of Canada, 1955 (estimated).

The table brings out:

- (1) the part played by Canadian mills in the expansion of United States supply, not only in terms of tonnage but also in terms of their proportion of total supply;
- (2) the decline of United States production through to 1945 and the subsequent upturn to date (the recent growth of United States production has resulted in a slight gain in the United States mills' proportion of the market);
- (3) the relatively minor place occupied by European producers. Though their proportion was significant before the war, they have not returned to the market on any appreciable scale since the war.

There is little doubt that supply from Europe will not again become of importance to the United States. The European resource position is such that, over the long term, this region will itself become more dependent upon imports of newsprint to meet internal requirements. Hence the prospects are for either a further decline in tonnage shipped to the United States or,

at best, the maintenance of token shipments at about current levels, perhaps as a source of trade dollars. In either case, Europe can be omitted as an important supplier of United States long-term newsprint needs. This leaves Canada and the United States itself as potential sources of supply.

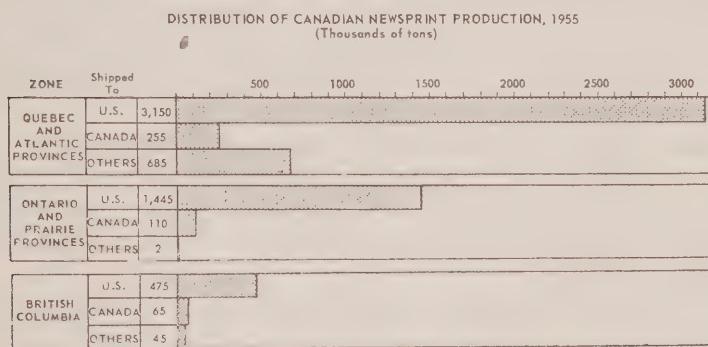


Figure 21

In recent years the downward trend of United States newsprint production has been arrested and has turned upward. Announced plans of United States producers indicate some 600,000 tons of new productive capacity in the United States in the next three years. Most of the increases of recent years in United States productive capacity and those planned in the immediate future are the result of developments in the southern states in the use of southern pine.

The development of a newsprint industry in the South has resulted from two factors. The first was the technological development which made it possible to produce newsprint from the resinous, fast-growing softwoods of the southern states. The second factor (less frequently recognized) is that the southern economy—in terms of population and economic well-being—is developing to such an extent that the South itself is a substantial and growing market for newsprint.

But the future course of newsprint development in the South is difficult to estimate with accuracy. Certain influences can be considered, but the final result will depend on many complex economic forces. Southern pine is valuable for pulp and paper making, in some respects more valuable for other products than for newsprint. Its long, strong fibres make it particularly adaptable for kraft pulps used in paperboard and packaging materials, as the great growth of this type of production in the South shows. As over-all pulp and paper production expands, the early abundance of low-cost wood encounters competition among various uses. While apparently there is still an adequate supply of southern pine, large areas sufficient to support modern pulp or paper mills in perpetuity are less easy to find; moreover, with the growing demand for wood, their cost is rising. As the expected ex-

pansion of the United States population and economy proceeds, the demand for products other than newsprint will also rise. This competition will undoubtedly bear with special weight on the wood supply of the South, particularly in regard to those products for which this wood has proved itself to be specially suitable. In other words, newsprint production in the South may be expected to expand, but will not do so without competition from other pulp and paper products. Costs of wood for newsprint production in the South are rising and will probably continue to rise, and the gap between southern and Canadian wood costs is likely to narrow.

Another limiting factor on southern newsprint development is water, which is required in very large quantities and in a high state of purity. No doubt the problem of water supply can be solved through technology but not until after some delay and at a cost which will be reflected in total production costs.

One feature of southern pine may be worth brief comment. It is frequently suggested that the fast growth of this species gives an overwhelming advantage to newsprint production in the South. But the advantage of growth speed is in fact slighter than is usually supposed and is highly debatable. Once a log of wood reaches a mill, it makes no difference whether its growth has taken 30 years or 90. Longer growth may actually give it a higher and better cellulose content. The speed of growth however, does bear to some extent on cost. The forest area needed to support a mill in Canada is approximately three times the area required for a comparable mill in the South. The smaller area has some advantages in fire protection, silviculture and ease of handling, but it may well be that favourable stream-flow will transport the 90-year-old log to the mill more cheaply than trucks and railways can carry the 30-year-old log to its destination. The advantages of rapid growth are cost advantages, not quality advantages; they may be considerable but are not overwhelming.

On the assumption that the development of pulp and paper production in the southern States has now reached a stage of relative maturity, it would not be unreasonable to expect that the growth of newsprint production in the South would proceed in step with, or slightly ahead of, the growth of newsprint demand in the United States. It can be expected that southern newsprint producers will absorb much of the local market and establish for themselves an area that they can service more efficiently than any other suppliers. Moreover, southern newsprint can be expected to develop export markets that can be efficiently served from the area.

In the rest of the United States, the future of newsprint production depends largely on recent developments in the use of hardwoods. Advances made at a mill in Maine may open the way to a considerable expansion of newsprint production in the northwestern and midwestern parts of the United States. Such developments are equally open to Canadian mills for the utilization of Canadian hardwood supplies that are at present unused.

It is difficult to translate the foregoing into quantitative terms in order to develop the long-term outlook for United States newsprint production, though it is necessary to do so if requirements for Canadian newsprint are to be calculated.

At the beginning of this section it was noted that the proportion of United States newsprint requirements supplied by domestic production had recently turned upward, reflecting increases in United States capacity. In 1950 United States capacity totalled just over one million tons; by 1955 this had reached 1.4 million tons and a further 600,000-ton expansion has been announced. Additional but more tentative plans might raise capacity to 2.1 million tons by 1960.

If all of these plans reach fruition as now contemplated, and if United States exports—about which more is said shortly—maintain their present ratio to output, United States domestic shipments would total 1,850,000 tons. This would account for almost 26% of total United States market needs. Most of this expansion, as has been mentioned, will have taken place under a special programme containing accelerated depreciation provisions. This programme was conceived during the shortage conditions which prevailed briefly during the Korean war; the newsprint programme was part of a larger over-all plan to achieve certain expansion targets in defence and related industries.

There is every indication that United States demand and supply will be in good balance by 1960, when the programme is completed; and this provides a basis for assuming that the location of new capacity in Canada and the United States will be determined by free competitive forces. On this assumption we might reasonably expect Canadian mills to maintain their position in the expanding United States market.

These assumptions are embodied in Table 44, which sets forth United States supply prospects by sources, with actual data for 1950 and the latest estimates for 1955 included for purposes of comparison.

Table 44

PROSPECTIVE UNITED STATES NEWSPRINT SUPPLY^a
BY SOURCES
(thousands of tons)

Year:	From			Total
	United States mills	Scandinavia ^b	Canada	
1950.....	1,002	171	4,748	5,921
1955.....	1,270	125	5,025	6,420
1960.....	1,850	100	5,250	7,200
1965.....	2,040	100	5,710	7,850
1970.....	2,168	100	6,380	8,650
1975.....	2,470	100	6,930	9,500
1980.....	2,730	100	7,620	10,450

^a On the assumptions (1) that United States and Canadian shares will remain at 1960 proportions, and (2) that imports from Scandinavia will be maintained at token levels.

^b The term "Scandinavia", here refers to Norway and Sweden and includes Finland.

8. *Canada's Newsprint Exports to the Rest of the World*

The forecast of Canada's share of the newsprint markets in countries outside of North America is even more difficult than that for the United States market. The economic factors which will determine the sources of supply to meet overseas needs are more complex and subject to rapid change. In the short term at least, monetary and exchange difficulties will depress the buying power in dollars of other countries. These difficulties will persist until a solution is found which will leave Canadian and United States markets more freely open to the goods of other countries and thus create buying power for newsprint and other commodities needed from us.

That there will be need for North American newsprint in overseas markets can be in little doubt. The principal limiting factor on domestic supply of newsprint in most of these countries is wood in species and in locations that can be used for the economic production of newsprint, though in the underdeveloped countries particularly, capital deficiencies also impose serious limitations.

Moreover, because of the more rapidly rising economic levels and the population expansion in other countries of the world, the competition of other pulp and paper products and other forest industries for available wood supplies will be even fiercer than in North America. In recent years, newsprint has lagged in this competition, the production of non-paper pulps, finer paper grades and packaging materials having risen more rapidly than that of newsprint in established United Kingdom and Scandinavian industries. Considerable newsprint production capacity still classified as such has not been used for many years, and is probably being permanently devoted to other lines.

Prospective economic and population trends in overseas countries, plus current relatively low levels of newsprint use, indicate rapidly rising demands for the future. It will be recalled that we have predicted a rise from the present (1955) level of consumption of nearly six million tons to more than 14 million tons in 1980. It seems reasonably certain that available forest and capital resources in the rest of the world will not be sufficient to provide for an increase of this magnitude in overseas production. If, then, prospective overseas requirements are to be met, these countries must look increasingly toward North America as a source of supply.

A detailed study of possible long-term production trends overseas would be a lengthy and complex process—too lengthy for inclusion here. The United Nations and related agencies have published a wealth of material that has to do, in great detail and often country by country, with the question of resources, technology and capital requirements. All that can be done here is, in effect, to use the results of this extensive research, along with the knowledge of such plans as have been announced for the near future, as the basis

for prediction. In these projections, as with the projections of prospective overseas demand, the totals were built up from regional estimates. Lack of information in some instances required rather arbitrary decisions, but this could not be avoided. The results are shown in Table 45, along with the demand projections given earlier. A third column in the table then shows the deficits which must be made up by the overseas countries by imports from North America.

Table 45

PROSPECTIVE OVERSEAS NEWSPRINT SITUATION

(thousands of tons)

Year	Production	Requirements	Required imports
1950a.....	3,446	3,698	252
1955a.....	4,795	5,750	955
1960.....	5,650	7,250	1,600
1965.....	6,500	8,800	2,300
1970.....	7,500	10,400	2,900
1975.....	8,750	12,250	3,500
1980.....	10,150	14,350	4,200

a 1950: actual; 1955: latest estimate. In order to make the column "Required imports" accurately reflect imports from North America in 1950 and 1955, production in 1950 has been reduced by 171,000 tons and in 1955 by 125,000 tons, which are the tonnages exported to the United States in these two years.

It should perhaps be emphasized that the table treats the overseas countries as a single unit. By definition, the "required imports" estimates mean required from Canada and the United States, the only two countries outside the unit.

The remaining question in this section, then, is how much of this prospective overseas demand will be supplied by Canada and how much by the United States? On several counts, there can be little doubt that most of it must come from Canada. We are already the major exporter to the overseas countries, and the history of this trade goes back several decades. Before the war, our overseas shipments were equal to almost one-quarter of our output, and only the postwar upsurge of demand on this continent, along with trading difficulties and restraints overseas, has kept down the volume of these shipments since the war. The recent trend of our overseas exports is also significant: from a low of 208,000 tons in 1950, when exchange problems were particularly severe, our shipments in 1955 totalled some 725,000 tons. It is reasonable to expect that the Canadian industry will continue to expand this trade in the future. Conversely, United States participation in overseas newsprint exports is likely to be limited: in view of the indicated increase in United States domestic requirements, it is highly improbable that the American newsprint industry will produce any appreciable export surpluses.

As to how the overseas requirements might actually be divided between the Canadian and the United States industries, again there is very little to go on. We have argued, however, that United States exports are likely to

be of limited size, and it follows from this that any estimates within the range of practical possibility are unlikely to affect greatly the prospective overseas demands on Canada. In the circumstances, there appears to be no better assumption than that the United States industry will continue approximately its recent general distribution pattern. About 88% of United States production goes to the domestic market and the remaining 12% is exported. If, then, we assume that the 1960-to-1980 estimates of domestic shipments of United States mills given in Table 44 may be taken as 88% of future production, prospective United States production and shipments will be as shown in Table 46. This table also shows the resulting prospective export demands on Canada.

Table 46

**PROSPECTIVE UNITED STATES PRODUCTION AND SHIPMENTS
AND OVERSEAS NEWSPRINT DEMANDS ON CANADA**

(*thousands of tons*)

United States production and shipments

Year	Production	Shipments to:	
		United States	All others
1955.....	1,500	1,270	230
1960.....	2,100	1,850	250
1965.....	2,315	2,040	275
1970.....	2,460	2,170	290
1975.....	2,805	2,470	335
1980.....	3,100	2,730	370

Overseas import requirements by sources

Year	Total	Imports from:	
		United States	Canada
1955.....	955	230	725
1960.....	1,600	250	1,350
1965.....	2,300	275	2,025
1970.....	2,900	290	2,610
1975.....	3,500	335	3,165
1980.....	4,200	370	3,830

9. Recapitulation: Prospective Requirements for Canadian Newsprint

Thus, with the many uncertainties, qualifications and guesses involved in this attempt to forecast the grand total of available demands for Canadian newsprint over the next 25 years, the estimates result as in Table 47.

These estimates foresee more than a doubling of shipments to Canada over the next 25 years, a 50% increase in shipments to the United States and, reflecting the large overseas demand potential, more than a fourfold increase in shipments to other markets. In all, a doubling of Canadian shipments and, therefore, a doubling of production would be needed to meet these requirements.

Table 47

PROSPECTIVE DEMAND FOR CANADIAN NEWSPRINT (*thousands of tons*)

Year	Canada	United States	Other markets	Total Canadian demand	
				By addition	Rounded
1955.....	430	5,025	725	6,180	—
1960.....	485	5,250	1,350	7,085	7,100
1965.....	575	5,710	2,025	8,310	8,300
1970.....	690	6,380	2,610	9,680	9,700
1975.....	820	6,930	3,165	10,915	11,000
1980.....	965	7,620	3,830	12,415	12,500

Other Pulp and Paper Products

1. General Comments

The various grades included under this heading are: book, writing and groundwood papers; paperboard; wrapping papers; and tissue, sanitary and specialty papers. Production of these grades is usually thought of as small but, in fact, they make up an important part of the industry's products. By any test other than direct comparison with newsprint and pulps, their combined output, which totalled almost 1,650,000 tons in 1954, is impressive. Moreover, as is shown in Table 48, production is expanding rapidly.

Table 48

CANADIAN PULP AND PAPER PRODUCTION, 1939 AND POSTWAR

(thousands of tons; index: 1939=100)

Year	Newsprint		Market pulpa		Other grades	
	Tons	Index	Tons	Index	Tons	Index
1939.....	3,175	100	725	100	674	100
1946.....	4,506	142	1,445	199	1,185	176
1950.....	5,279	166	1,892	261	1,493	222
1954.....	5,984	188	2,240	309	1,649	245

a Paper-pulp exports plus dissolving pulp production.

By far the bulk of this production goes to the domestic market. Of the 1954 production of 1.65 million tons, only some 138,000 tons were exported, and a sizable part of this, 28,000 tons, was groundwood papers exported to the United States. These groundwood papers are near-newsprint grades used for various kinds of printing, including some kinds employed by newspapers themselves.

Throughout this study of other grades of pulp and paper products, the distinction between free-traded and tariff-protected commodities should be kept constantly in mind. Newsprint and market pulps (which will be studied later) move in international trade in response to effective demand and rarely

encounter tariff barriers and for Canada, the volume of trade in these commodities has become large. Canadian mills producing newsprint and pulps were able to adopt the economies and efficiencies of long-run mass production and thus to compete successfully with producers in other countries.

For these other pulp and paper products, against which other countries have generally high tariff barriers, the development of the Canadian industry has been determined almost entirely by the market in Canada. Mills making these products have been unable to reach the large-volume markets of the world—particularly those in the United States—except sporadically, when demand has been unusually high and customers in other countries have been prepared to buy and pay the local tariff charges. Canadian manufacturers have had to equip themselves, and operate, to produce a large number of different grades, weights and colours in short runs and to ship them at higher transportation costs in an east-west movement to supply the Canadian market. Within these limitations, these segments of the industry have had some success in lowering their costs and increasing their efficiency. But substantial cost disadvantages remain by reason of the nature of the market on which they depend. In contrast with manufacturers of these grades in the United States, these mills in Canada cannot generally get the cost advantages of long runs and mass production methods.

For example, there are nearly 500 grades of book and writing papers manufactured in Canada; the average manufacturing run of boxboard is probably about 11 to 12 tons. In the United States, a writing paper mill may produce only eight or ten different grades in very large volume; a paper-board machine may run continuously on only one grade. When a machine is changed from one grade to another substantial costs are incurred in idle time and the cleaning of machines and the start-up on a new grade. These "make-ready" manufacturing costs are virtually the same for a 25-ton order as they are for a 2,500-ton order, but the cost per ton is one hundred times as great. Moreover, Canadian mills generally do not operate on Sundays, but the majority of mills in the United States operate continuously seven days a week. The extra tonnage gained by Sunday operation reduces overhead charges and mill burden per ton of production by at least 10%. For these other pulp and paper commodities, Canadian production is tailor-made to meet actual orders received. The manufacturers have certain standard grades, weights and colours, but they must produce these particular grades against orders received rather than produce for stock.

Yet Canada needs these other segments of its pulp and paper industry to service a growing population with the multiplicity of products a modern industrial nation requires. The experience of the war years and the more recent period of defence build-up showed that Canada could not rely on United States mills as a source of supply for these products, which were in short

supply in the United States. Even in times of no international emergency, these are the types of products that Canada should produce for herself.

Accordingly for these other commodities the emphasis in the discussion that follows will be on trends of the Canadian market. In effect, then, it will be assumed that Canadian tariff policy will take account of the differences in costs arising from the different forms of these industries in Canada and the United States and that it is reasonable to expect that these segments of the pulp and paper industry will be able to capture and hold virtually the entire Canadian market as it grows. That growth will be measured by available estimates of increases in Canadian population and Gross National Product. As to exports, it will be assumed that the proportion of total production exported will not be greatly different from what it is today.

2. *Book, Writing and Groundwood Papers*

This section of the pulp and paper industry could be called its Jack-of-all-trades. It can be visualized best by considering what it does not produce rather than what it does. It does not include newsprint, wrapping, tissue, bag, building and construction papers nor paperboard, but it does include almost everything else.

Groundwood papers, which currently make up about 27% of the total production of these grades, are defined as those papers which contain more than 50% groundwood pulp. Most groundwood paper is manufactured in mills also producing newsprint. The high groundwood content makes for lower-cost paper but does not provide qualities of strength and permanency equal to those found in papers made from more highly processed pulps. Book papers contain a higher percentage of chemical pulp and account for one-third of the total output. The fine or writing papers, such as bonds and ledgers, make up another third, and miscellaneous grades cover the remaining 6%. The base stock for coated and other converted papers is included in these categories.

Altogether more than 500 grades are produced, ranging from the half-tone news, which contains only slightly less groundwood pulp than newsprint, through the chemical wood pulp grades such as book, envelope, tablet and coated papers to grades made wholly from new linen and cotton rags. Show cards, index cards, and wedding invitations, although cardboard, are also classed as fine paper.

These papers serve the needs of industry, education and culture. They include papers used in the form of stationery, business forms, bank note currency, books and magazines. Coated papers are used most frequently for high-quality printing such as appears on labels, special reports, and photographic reproductions.

With the exception of groundwood papers—more than 50% of the production of which is exported at the present time—only about 5% of these grades has been exported in recent years, while imports are currently filling about 4.5% of total Canadian consumption.

As a result of the wide variety of production necessary to supply the needs of the relatively small domestic market, a special kind of industry has developed, designed to provide great flexibility of production but unable to use all the advantages of mass production methods. Equipment has been adapted to produce small orders of a large number of different products, and there is considerable shutdown time for the paper machines while they are being set up for the varying requirements.

The history of this segment of the pulp and paper industry goes back to the first paper mill established in Canada at St. Andrews, which produced writing, wrapping and printing papers and boards and also made the paper for the *Montreal Gazette*. The second paper mill was built near Halifax in 1819. In 1825, Ontario became the third province to produce paper when a mill was built at Crooks Hollow, now Greensville, near Hamilton. Another mill came into operation in the Don Valley near Toronto in 1827. Other early mills included one at Stanstead, Que., established in 1832, and one near Donnacona, Que., that went into operation between 1817 and 1823.

While the paper industry made some progress during the first half of the nineteenth century, most of the roots of the present fine-paper industry go back only to the latter half of the century. The first major stimulus to expansion came with the need to meet the demand occasioned by World War I. Unfortunately, no reliable statistics are available for the time prior to 1920, when output amounted to 68,000 tons. Table 49 gives the statistics for significant years.

Table 49

BOOK, WRITING AND GROUNDWOOD PAPERS IN CANADA

(aggregates in tons; per capita in pounds)

Year	Production	Imports	Exports	Supply to Canada	Per capita consumption
1920	67,589	4,150	5,109	66,344	15.5
1929	107,725	14,616	7,489	113,692	22.7
1930-34	89,854	6,868	9,101	87,720	—
1935-39	120,425	4,891	19,844	105,233	—
1940-45	158,232	4,617	18,838	143,981	—
1951	248,717	7,817	30,030	225,404	32.2
1952	234,152	8,427	45,469	196,893	27.3
1953	250,332	9,528	41,684	217,377	28.6
1954	269,381	12,554	48,106	231,168	29.6

SOURCE: Production, export, supply and consumption data—Canadian Pulp and Paper Association.
Import data—Dominion Bureau of Statistics.

After a short but sharp recession in 1921 output increased erratically through the 1920's; it was 1926 before it exceeded the level of 1920. From 1926 through 1929, however, rapid expansion carried production from 61,000 tons at the beginning of the period to 108,000 tons at the end.

This level of output was sharply reduced during the first years of the depression. The average for the years 1930-34 was 90,000 tons, with a low of 82,000 tons in 1933. During the latter half of the decade, consumption of these papers expanded substantially. Production averaged 120,000 tons through the last five years of the 1930's and reached a record high of 133,000 tons in 1939.

World War II proved through experience that papers produced by mills of this segment of the industry had a high degree of essentiality. It was realized that the wartime industrial economy was dependent on regular supplies of these papers. Thus, while controls were applied and while grades, weights, colours and kinds were simplified, with considerable substitution, over-all production was never below the 1939 level, and by 1945 it had reached 162,000 tons.

After the removal of wartime restrictions, extensive work in increasing the range of paper grades was done to meet the needs of the modern market; and, during the postwar period, in keeping with the growth of the Canadian economy, a spectacular expansion has taken place. Though there were minor setbacks in 1949 and 1952, production in 1954, the latest year for which complete statistics are available, reached 269,000 tons, of which 219,000 tons were consumed in the domestic market. Exports, three-quarters of which were groundwood papers, were 48,000 tons, and imports amounted to 12,500 tons.

In Table 50 the estimates of demand for these grades of papers are shown at 5-year intervals through to 1980:

Table 50

OUTLOOK FOR BOOK, WRITING AND GROUNDWOOD PAPERS IN CANADA

(*thousands of tons*)

Year	Production required	Exports	Imports	Canadian supply
1960.....	325	49	13	289
1965.....	387	58	16	345
1970.....	458	69	18	407
1975.....	539	81	22	480
1980.....	634	95	25	564

These forecasts were based on a simple projection of per capita consumption for the period 1920-54. Estimates of future imports were based on the historical percentage of consumption supplied by imports since 1920.

This percentage was less in later years than it was at the beginning of the period, but no clear trend was evident. Since 1930 (except for the war years) 4.5% of consumption has been filled by imports, and this percentage has been used in all estimates.

The export projections have been based on the assumption that exports will be equal to 15% of total demand for these grades. This is probably a conservative figure. It assumes increases in external demand of equivalent rate to that projected for Canada, and this in itself suggests a considerable growth. But the conservatism lies in the difference between rising overseas demand and rising demands on Canada. The latter may very well increase more rapidly as world demands for the products of the forest press more heavily on limited overseas resources.

One reason for the apparent lag in the Canadian per capita consumption of these grades as compared with that of the United States, is the effect of existing tariff provisions. In the Canadian tariff concessions made at Torquay in 1951, papers for the use of Canadian magazine publishers were made free of Canadian tariff duties. In the United States tariff a substantial tariff barrier, made up of combined specific and ad valorem rates, continues to apply and effectively bars Canadian mills from access to the large United States magazine paper market. In addition, printed magazines enter Canada duty free and the volume of magazine paper thus imported for Canadian use is substantial. In 1952, it was estimated that this volume totalled nearly 45,000 tons. This Canadian consumption of magazine paper has not been supplied by Canadian paper mills. It has been theoretically possible to invoke drawback provisions in the United States tariff to recapture most of the tariff paid on papers imported into the United States and later re-exported to Canada, but administrative practices and delays of United States customs procedures have made this extremely difficult or impossible. A simplification very recently made in United States customs practices may expedite the drawback procedure, but until this has been demonstrated or, alternatively, until a greatly expanded printing in Canada of Canadian editions of American magazines takes place, an important portion of the domestic market for magazine papers is effectively closed to Canadian mills.

3. Paperboard

Paperboard is a felted sheet of wood fibres varying in thickness from about 7/1000 of an inch to 60/1000 of an inch. The product may be identical in substance and quality throughout, or it may emerge as a sheet composed of layers made from different kinds of pulp or a combination of pulp and wastepaper. The raw material of paperboard consists chiefly of wood pulp, but some grades are made in whole or in part from straw pulp or from repulped wastepaper. Paperboard's main use is in packaging although

some is used in the manufacture of gypsum wallboards and some is laminated into varying thicknesses for use in building boards.

As the uses for paperboard have expanded and grown, the mills have expanded their production facilities to meet the demand. For almost every packaging purpose paperboard has demonstrated its superiority to competing materials. While over the years there has been a marked increase in the utilization of all varieties of boxboard, it is container board that has accounted for most of the growth in the past ten years.

Two main types of paperboard are included in the grade classification here used. These are container boards and boxboards.

Container board production falls into three main categories: liner, corrugating material and container chipboard. In all its forms it is used almost entirely in the manufacture of shipping cases. Liner board is a hard, strong, firm board manufactured in two forms: kraft liner and jute liner. Kraft liner is produced from kraft pulp; jute liner is made from kraft pulp combined with repulped paper. Corrugating board is the fluted paperboard seen in corrugated shipping cases. Container chipboard, produced entirely from waste paper, is laminated between liners for manufacturing solid fibre shipping cases as distinct from corrugated cases.

Like container board, boxboard also falls into three main categories: folding, set-up and all other grades. Folding boxboard is the source of a wide range of manufactured folding cartons which are printed and shipped flat to the consumer, who forms and fills them. Examples can be found on the shelves of any supermarket, packaging everything from cigarettes to soap flakes. Set-up boxboard is a non-folding paperboard. It is employed where a rigid container is required. Set-up boxes are used for packaging candy, shoes, pharmaceuticals, papeteries — in fact, for any product where rigidity in the container is essential. The "all other" category of boxboard products includes paperboard used in wrapping rolls of newsprint paper and in the manufacture of gypsum wallboard, milk bottle caps, pie plates, paperboard for lamination into building board and many other non-packaging uses.

Since 1930, Canadian requirements of paperboard have grown from 155,000 tons to just over 740,000 tons in 1955. This high growth rate has been accounted for by two factors: (1) the growth in the volume of goods distributed in the economy and (2) the development of new uses for paperboard, largely as a service commodity in the distribution system. The following tabulation showing paperboard consumption in Canada per dollar of consumer spending in the four years 1951 to 1954, suggests that in very recent years paperboard requirements have been closely related to the volume of goods distributed to consumers—that is, only to the first of the two factors.

1951.....	.119 pounds
1952.....	.106 pounds
1953.....	.112 pounds
1954.....	.111 pounds

This relationship has been used as the basis for calculating Canadian requirements through to 1980. This is probably conservative since new uses may well be developed which will increase paperboard consumption in relation to consumer spending. Such increases, however, are not predictable, and it has simply been assumed that the 1954 figure of .111 pounds per dollar will remain constant through to 1980. The application of this figure to projections of per capita consumer spending and populations gives the estimates shown in Table 51.

Table 51

OUTLOOK FOR CONTAINER BOARD AND BOXBOARD IN CANADA

(*thousands of tons*)

Year	Consumer spending projection	Straight-line projections ^a
1960.....	918	913
1965.....	1,105	1,125
1970.....	1,348	1,367
1975.....	1,611	1,647
1980.....	1,911	1,976

a See text for explanation.

The second column in the table shows a second set of Canadian demand estimates based on a straight-line projection of the past per capita consumption trend. In the 20-year period 1936-55 Canadian per capita consumption of container board and boxboard grades increased by 44 pounds. The assumption is that this rate will continue; that is, that in each 5-year period from 1955 to 1980 consumption per capita will increase by 11 pounds. The extension of these per capita estimates gives results remarkably close to the estimates based on the consumer spending projection, and this tends to confirm the reasonableness of the first estimates.

In distribution before the war, about 84% of Canadian production was used at home and 16% was exported. Since World War II, more than 90% of Canada's production has been used at home and, in the last three years, only about 9% has been exported. It is assumed, however, that growing world requirements in the next 25 years may be expected to result in a relative increase in export demands on the Canadian industry. To meet these demands it has been assumed that Canada will provide the export markets with from 10% to 15% of her production. Should exports be projected at 12½%, total demand would be as shown in Table 52.

Table 52

OUTLOOK FOR CONTAINER BOARD AND BOXBOARD IN CANADA

(thousands of tons)

Year	Production	Domestic requirements	Export requirements
1960.....	1,050	918	132
1965.....	1,265	1,105	160
1970.....	1,540	1,348	192
1975.....	1,840	1,611	229
1980.....	2,180	1,911	269

4. Building Boards and Building Papers

Products in this group range from hardboard and heavy laminated boards to soft or insulating boards and a variety of building papers and impregnated felts. Hardboards are produced from wood that is defibrated by various processes. The fibre content of insulating softboards is also mostly defibrated wood, with wood pulp screenings making up part of the furnish. The other products of the group are made largely from wood pulp screenings, rags and wastepaper. The result is that these products, as a group, do not account for large quantities of pulpwood, although their consumption is of interest because they provide outlets for forest species not hitherto converted into useful commercial products. Furthermore, they make possible the economic use of waste materials from lumber and pulp mills and of wastepaper.

Demand prospects for building boards are examined in Chapter 4 under "Lumber and Allied Products". For building papers, it is assumed that demand prospects will parallel those for building boards.

Table 53 embodies this assumption. The table also incorporates, in tonnage units, the estimate for building boards shown on page 81 in Chapter 4. The figure for 1954 is also included for reference purposes.

Table 53

OUTLOOK FOR BUILDING BOARDS AND BUILDING PAPERS IN CANADA

Year	Tons
1954.....	227,000
1960.....	289,500
1965.....	347,500
1970.....	412,000
1975.....	487,500
1980.....	575,000

5. Wrapping Papers

"Wrapping" is a misleading term to apply to all the types of paper included in this segment of the industry, which, in the main, are those made almost exclusively from kraft or sulphate pulp. They have the familiar kraft

brown or ochre shades so often seen in paper bags and on retail store counters. But only about 20% of all the grades of paper in this classification is used for actual wrapping purposes. The other 80% is used for a multitude of different purposes: 33% for the manufacture of paper sacks of the multiwall type as a means of packaging bulk materials; 25% for the manufacture of grocery and other bags; 4% for the manufacture of gumming paper; and 3% for the manufacture of envelopes. The remaining 15% is waxed, waterproofed, asphalted or treated in one of many other ways before it finally reaches the consumer.

Wrapping paper was first made in Canada about 1805 at the first paper mill at St. Andrews. But the development of the wrapping paper industry as we know it today began a half century ago when, in 1907, Canadians introduced kraft or sulphate pulp, first made in Sweden, to North America. It was first produced in that year in the mill at East Angus in the Eastern Townships of Quebec. Today there are 12 producing mills located in central Canada and in British Columbia, some small and some large, employing a total of about 16,000 in mills and forests. Together they represent a capital investment of some \$60 million and produce goods to the value of about \$50 million annually.

By 1912, Canadian production of kraft paper had reached an annual total of some 5,000 tons, and consumption some 8,000 tons, the deficiency being made up by imports. Production, however, increased sharply in that year, with the opening of what is now the Wayagamack mill of the Consolidated Paper Corporation in Three Rivers. Figures compiled at that time indicate that the output of kraft pulp operations increased to an annual total of some 25,000 tons, of which about one-half was converted into paper.

Table 54

**WRAPPING PAPER: PRODUCTION, EXPORTS AND IMPORTS
IN CANADA**

(aggregates in tons; per capita in pounds)

Year	Production	Exports	Percentage exports	Imports	Supply	Per capita
1917.....	50,360	11,311	22.5	2,333	41,382	10.3
1920.....	77,292	18,987	24.6	3,693	61,998	14.5
1928.....	111,667	16,952	15.2	5,745	100,460	20.4
1930-34.....	74,418	11,442	15.4	3,156	66,132	12.6
1935-39.....	97,591	16,467	16.9	1,995	83,119	15.0
1940-45.....	155,455	31,269	20.1	853	125,039	21.3
1951.....	257,332	15,385	6.0	1,167	243,114	34.7
1952.....	222,529	12,991	5.8	892	210,430	29.2
1953.....	238,111	11,015	4.6	710	227,806	30.8
1954.....	250,408	13,662	5.5	3,316	240,062	31.6
1955.....	256,000	14,500	5.7	3,000	244,500	31.3

As was the case with so many other segments of the industry, the real growth of kraft paper production dates from World War I, but it is

impossible to trace this growth prior to 1917 because statistics were not then assembled. In that year (1917) Canada produced about 50,000 tons, of which 11,000 were exported and the remainder consumed at home. Production rose to a peak of about 77,000 tons in 1920, one of the boom years, but slumped back again to 53,000 tons in 1921. It recovered rapidly during the economic surge of the early '20's and reached a peak of nearly 112,000 tons in 1928. Exports in that year were 17,000 tons or 15% of production.

Owing to the economic depression of the 1930's, the production peak of 1928 was not exceeded until 1940. Reflecting the pace of depressed industrial activity, production in the years 1930-34 averaged less than 75,000 tons. But again, in response to a somewhat accelerated pace, this average increased to just over 97,000 tons in the second half of that decade. It was in this latter period that the use of multiwall sacks, first brought into the market in 1925, began to take hold. This outlet for kraft papers, which has contributed so much to their volume growth in the postwar period, no doubt had much to do with the improved level of production during the last half of the 1930's.

The war years, 1940-45, proved the adaptability of these papers to the economic packaging of goods of all kinds, and they were given high essentiality ratings both for war production and for the civilian economy. Kraft pulps needed for their manufacture were, with due regard for other priorities, allocated in quantities to increase production, with the result that the average output for this 5-year period was just over 155,000 tons. Here again, with a shortage of jute and the diversion of cotton to other uses, heavy-duty kraft multiwall sacks, sometimes with asphalt laminations and other coatings or impregnations, proved indispensable and were developed to a high degree of serviceability. The knowledge thus gained through necessity has resulted in permanent acceptance of these sacks as a medium for bulk shipment of many commodities, and the result has been that since 1945 the tonnage of kraft paper converted to these sacks has increased sharply.

In recent years of buoyant economic activity, both production and consumption have increased substantially. In the year 1951 production stimulated by the Korean War reached a peak of 257,000 tons, and although there was a decline to 222,000 tons in 1952, there has been a gradual increase in each subsequent year, and production in 1955 was within close range of the peak of 1951.

As is the case with all segments of the industry other than pulp and newsprint, exports of wrapping or kraft papers have never been a large-volume item. While in earlier years exports ranged as high as 10% to 15% of production, the export volume was not then large—only about 15,000 to 20,000 tons annually. During World War II, exports, to meet the needs of our allies, were at their highest average levels—more than 31,000 tons or 20% of production—but they have progressively declined in the postwar years

until currently they are at about 12,000 tons or only 5% of production. Restrictions of currency have operated to reduce exports to traditional Commonwealth markets which could be reached under the British preferential tariff, and the United States tariff prevents substantial entry into that market. Fortunately the growth of demand at home has more than offset the loss of volume in the United Kingdom and Commonwealth countries.

The many uses that have been developed for wrapping papers have caused them to become so enmeshed in the fabric of our industrial economy that it is fair to conclude that as Canada's economic future grows and develops so will the future of this segment of the industry grow and develop. As our population and Gross National Product increase, so will the production of wrapping papers increase. Additionally, there is little doubt that research will develop new uses for these papers. It is to be noted that the per capita consumption of them in Canada is below that of the United States. Finally, it is reasonable to expect that overseas markets, primarily those of Britain and the Commonwealth countries, will again turn to North America and principally to Canada for supply as their mounting needs grow beyond the capacity of their own resources.

In estimating what Canadian production and exports of these papers is likely to be in the years through to 1980, these factors have been taken into account. The result is neither the maximum nor the minimum of the projections but an average that seems to weigh all the probabilities reasonably.

Table 55

OUTLOOK FOR WRAPPING PAPERS IN CANADA

(aggregates in tons)

Year	Production	Exports	Imports	Supply
1955.....	256,000	14,500	3,000	244,500
1960.....	317,000	25,000	3,000	295,000
1965.....	368,000	30,000	3,000	341,000
1970.....	418,000	35,000	3,000	386,000
1975.....	469,000	40,000	3,000	432,000
1980.....	515,000	40,000	3,000	478,000

6. Tissue and Sanitary Papers

Tissue and sanitary papers include such items as fruit wrap and other wrapping tissues, foil backing, cigarette paper, toilet tissue, facial tissue, paper towelling, sanitary napkins and wadding stock. Sanitary papers such as paper towelling and toilet tissues make up more than 80% of the total tonnage involved.

While the volume of the products of this segment of the industry is not large in comparison with that of other segments, the products have many

uses that have proved to be important in the industrial economy and in the maintenance of health and comfort in modern communities. Their consumption increases with an increase in population and industrial activity and with improved standards of living. The historical growth trend is revealed in the following production figures:

Year	Production (tons)
1917	2,616
1920-24	4,800
1925-29	8,800
1930-34	11,500
1935-39	23,200
1940-44	39,500
1945-49	62,500
1950-54	85,200
1955 (est.)	106,000

The advent of paper towels during the 1920's and their growing acceptance have had much to do with the tonnage increases shown in each of the 5-year periods from 1930 onward. Paper towelling, however, has not been the only contributor to the growth of volume. Many of these papers found their way into war production and, although civilian uses were limited by wartime controls, production during 1940-44 averaged about 40,000 tons, or more than double that of the previous ten years.

In the years since the war, the annual volume has again more than doubled in response to increased population, industrial activity and standards of living. Volume in this period has also been increased by research and through ingenuity in finding new uses and in stimulating distribution and public demand.

There seems to be no reason why consumption of these papers should not continue in the future, to respond to the influences that have stimulated volume in the past.

On the basis of these factors and the estimates of future population, projections of future production have been made at 5-year intervals through to 1980, as shown in Table 56.

Table 56

OUTLOOK FOR TISSUE AND SANITARY PAPERS IN CANADA

Year	Production (tons)
1960.....	119,000
1965.....	140,000
1970.....	161,000
1975.....	182,000
1980.....	203,000

No attempt has been made to calculate any exports or imports, as the history of this segment of the industry to date is that exports and imports have been quite insignificant. Production has been almost entirely for domestic consumption.

Wood Pulp

In tracing the development of this segment of the industry, a distinction must first of all be made between market and non-market wood pulps. In the earlier discussion of the development and current structure of the Canadian pulp and paper industry, it will be recalled (Table 30) that end-product output in 1955 exceeded ten million tons. Just over three-quarters of this production was in the form of newsprint and other finished pulp and paper products; the remainder consisted of paper-pulp exports and dissolving pulp sold directly to the market. This latter tonnage is designated "market pulp". Conversely, the industry produced in 1954 some 9.5 million tons of pulp, about 7.25 million tons of which were used in the manufacture of paper or paperboard in Canada. This tonnage constitutes non-market pulp.¹³ The regional location and Canadian total of woodpulp production and the broad pattern of distribution are shown in Figure 22.

DISTRIBUTION OF CANADIAN WOOD PULP PRODUCTION, 1955
(Thousands of tons)

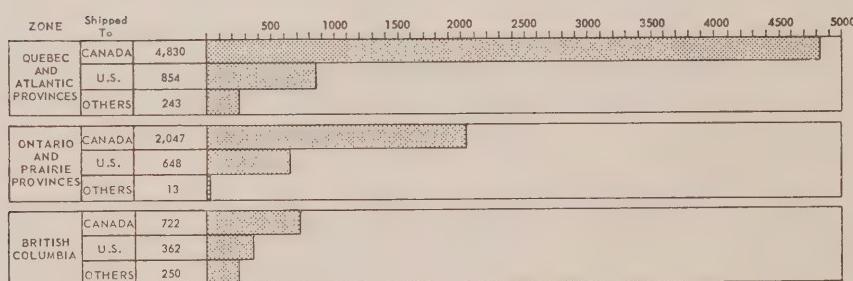


Figure 22

It follows that the outlook for pulp production in Canada will be determined by the prospective demand, already set forth in the two preceding sections, for newsprint and the other pulp and paper products, and also by the prospective demand for pulp in its unconverted state. We will begin with the latter and thus lead up to a final recapitulation of over-all industry trends over the next 25 years. We will express these trends first in terms of main products and then in terms of wood pulp equivalents.

¹³Of the 7.25 million tons of non-market pulp produced in 1954, about 351,000 tons were sold by Canadian pulp producers to paper and paperboard producers in Canada. Strictly speaking, this tonnage was also market pulp. However, in developing estimates of total pulp and paper demand on the industry as a whole an element of double counting is avoided if this tonnage is treated in the same way as integrated (that is, non-market) production.

1. *The Outlook for Export of Market Pulps*

The distribution of Canadian wood pulp exports is shown by major markets and market areas in Table 57. The data cover selected years and periods between 1929 and 1954. A further indication of the relative importance of the markets in these years is given by the percentage breakdown of exports shown in the lower half of the table.

As the table shows, the United States has taken, on the average, about 80% of all Canadian pulp exports. The trend of shipments was somewhat erratic before World War II, falling sharply from its 1929 level during the depression years. By 1939 the volume had recovered only partially, but major changes occurred in the war years. Loss of imports from the Scandinavian countries, which in the immediate prewar period had provided about two-thirds of United States market needs, created major supply problems and, to meet minimum essential needs of the United States wartime economy, exports from Canada were increased greatly. Under the joint wartime controls of the two countries, our exports were raised to an average level of more than 1.1 million tons, almost double their 1939 volume.

Table 57

CANADA'S EXPORT MARKETS FOR WOOD PULP (thousands of tons)

	1929	1939	Average 1940-45	Average 1946-49	1954
United States.....	711	607	1,113	1,415	1,670
United Kingdom.....	32	74	306	173	271
Commonwealth countries.....	1	—	15	11	3
Other European.....	42	14	5	26	101
Central and South America.....	—	1	13	11	60
Asia, Africa and the Far East.....	44	10	6	5	75
Total.....	830	706	1,458	1,641	2,180
(Percentages)					
United States.....	85.7	86.0	76.3	86.2	76.6
United Kingdom.....	3.9	10.5	21.0	10.5	12.4
Commonwealth countries.....	—	—	1.0	0.7	0.1
Other European.....	5.1	2.0	0.4	1.6	4.6
Central and South America.....	—	0.1	0.9	0.7	2.8
Asia, Africa and the Far East.....	5.3	1.4	0.4	0.3	3.5
	100.0	100.0	100.0	100.0	100.0

After a levelling-off period immediately following the war, Canadian exports to the United States continued to expand in consequence of the greatly accelerated United States consumption of all kinds of pulp products. United States converters of pulp looked more and more to their own sources and to Canada as a reliable source of supply. Currently, our exports of pulp to the United States are, at 1.6 million tons, almost three times larger than they were in 1939. Conversely, imports from Scandinavia, which had averaged about 1.4 million tons before the war, have in recent years been running at a level of about one-half million tons.

The future of Canadian shipments to the United States is difficult to assess. Since much of the expansion of our shipments has come from substitution for former imports from Scandinavia, that part of the growth of the past 15 years attributable to this factor is unlikely to continue. Moreover, expansion of the United States pulp and paper industry has tended in recent years to be largely in the form of fully integrated production. It seems reasonable to expect that the very substantial expected growth of pulp requirements in the United States will, to a large extent, be served by construction of new and integrated domestic capacity.

Nevertheless, the demand outlook for pulp and paper products in the United States is such that import needs appear likely to increase. The outlook has been subjected to analysis by the Paley Commission and by the Stanford Research Institute in its study for the Weyerhaeuser Timber Company. In this study the expectation is expressed that the United States, which imported just over two million tons in 1954, will double that amount to 4.1 million by 1980 while nearly doubling its own consumption from 20 million to more than 39 million. In this event, Canadian exports to the United States may, by 1980, be about 3.7 million tons.

Canada's second largest market is the United Kingdom. In 1929 Canadian pulp exports to the United Kingdom were only about 4% of total exports and about one-third of our shipments to all markets, the United States excluded. However, with the sealing off of Scandinavian supplies during the war, Canadian shipments to the United Kingdom expanded. In the postwar period, while Scandinavia is once again the major source of pulp supply for the United Kingdom, Canada, despite currency difficulties, has nevertheless not slipped back to its prewar position. Our shipments currently supply a much larger portion of United Kingdom requirements than before the war, and the prospects as the United Kingdom demand grows are that Canada's share of that market will increase substantially. We return to consideration of the United Kingdom market when we deal with the future potential of the European market as a whole.

Countries within the British Commonwealth, as well as Central and South American nations are supplied largely by Scandinavia and have accounted for but a small percentage of Canadian pulp exports. Some growth of shipments to Central and South American markets has, however, taken place since the war, and it is to be expected that this trend will continue. Prospective demand increases in these countries are very large, and it is unlikely that they will be able to obtain the substantially increased tonnages which are foreseen from their present major source of supply in Europe. These countries are likely to develop their own resources wherever such development may be economically sound, but to the extent that they are unable to do so they will turn to North America for their supplementary supply. This supply may take the form of imported papers as well as imported pulp;

and in our estimates we have made provision for only a minor increase of 60,000 tons of pulp in addition to newsprint.

In the "Asia, Africa and Far East" regions, Japan alone has been by far the dominant market for Canada, in 1954 taking 40,000 tons out of a total 75,000 tons shipped. But there is no doubt that the next 25 years will bring major changes throughout the whole area. The use of pulp and paper products, which, in the more highly developed countries, has paralleled economic growth and development, can be expected to reflect similar trends in these countries. The potential demand in these regions, with their huge populations, is enormous. But while it is possible to look confidently for considerable growth, translation of this growth into quantitative terms is difficult and is necessarily arbitrary. We have estimated that the import needs of this part of the world will rise by 290,000 tons between 1954 and 1980 and we have assumed that 70,000 tons of this increase might come from Canada.

The remainder of Canada's pulp exports went to Europe, principally to Belgium, France, the Netherlands and U.S.S.R. During the war, these markets were inaccessible, but postwar export volume, although still not large in relation to the total of Canadian shipments, has been rising sharply. In 1954, our shipments to these four markets totalled 79,000 tons, 19% of all pulp shipped to overseas markets.

Europe, including Great Britain, appears to hold for North America, and for Canada particularly, a considerable potential for expanded pulp shipments. This conclusion is indicated by studies prepared by the Food and Agriculture Organization and the Organization for European Economic Co-operation and current world wood pulp surveys prepared jointly by the Canadian Pulp and Paper Association and the United States Pulp Producers' Association. From a review of this literature, the long-term pulp prospects for Europe appear as shown below.

By 1980 the European demand for pulp and paper products of all kinds in terms of their pulp equivalents, is likely to be of the order of 20 million tons. Against this demand we estimate that the total productive capacity of European paper mills, after allowance for technical improvements and some new capacity, will reach a total, again in pulp equivalent, of the order of 14.4 million tons. To supply this production we have estimated that they will obtain pulp as follows:

	Thousands of tons
(1) Estimate of total pulp produced by European mills	14,000
(2) Less estimated exports	5,375
(3) Pulp available for own mills	<u>8,625</u>
(4) Pulp imports	5,756
	14,381

The foregoing estimates therefore leave a deficiency between requirements and production in the order of 5.6 million tons. This deficiency must be filled from increased European production involving the use of non-wood fibres such as straw or esparto, from increased European imports in the form of paper and paperboard products, or from greater imports of wood pulp than have been allowed for in our projections. Some part of the deficit is covered in preceding estimates of Canadian exports of newsprint and other grades of paper and paperboard. In newsprint, for example, a net increase in imports into Europe of more than one million tons was projected for the period 1954 to 1980. But if, in fact, European requirements reach the equivalent of 20 million tons of pulp and if this requirement is to be met, a further increase in market pulp demands on Canada in the order of two million tons is not inconceivable.

2. Domestic Demand Prospects for Non-Paper Pulp

One future element in the Canadian market pulp outlook must be taken into account, namely, prospective requirements of non-paper or dissolving pulp grades in the Canadian market. Separate data on shipments of this pulp in Canada are available only from 1944, but these show that the tonnages involved are quite small, ranging from a low of roughly 18,000 tons in 1947 to just over 61,000 tons in 1954.

Military essentiality brought this grade into prominence during World War II. Some of its uses were: in the making of explosives; in the manufacture of plastics as a substitute for metal components in electrical apparatuses, radios and instruments; and in military clothing. Since the war, many of these uses have been adapted to civilian requirements, and research has brought new uses. Examples are rayon fabrics, photo film and a host of moulded plastic products.

As to the outlook, lack of historical data prevents forward projection on the basis of past experience. The diversity of end uses, however, along with the probability of further development of new products, suggests a vigorous growth trend.

In the United States, past records for the use of dissolving pulp go back a few years earlier than our own. These show that United States consumption rose from 233,000 tons in 1939 to 870,000 tons in 1954. Future United States prospects for consumption of this grade were estimated by the Stanford Research Institute in its long-term study referred to earlier in this section. This study predicts a further rise to 1.8 million tons by 1975, representing a gain of 107% over current levels. In per capita terms, according to the Stanford population estimates, the gain is roughly 56%.

There is no reason to suppose that a similar increase will not be achieved in Canadian consumption, and the assumption that it will be has been used

as the basis for projection. In 1954, our per capita use of dissolving pulp was just over eight pounds. Taking the Canadian increase as similar to that of the United States—that is 56%—through to 1980 an indicated consumption of 12.4 pounds per person results. On the basis of population growth, aggregate consumption might reach 165,000 tons by 1980.

3. Total Prospective Market Pulp Demands

The over-all result of these forecasts indicates that market pulp demand on Canadian mills may be expected to increase from 2.24 million tons in 1954 to 5.05 million tons in 1980. The distribution of this tonnage by principal market areas is shown in Table 58.

Table 58

DISTRIBUTION OF CANADIAN MARKET PULP EXPORTS, 1954 AND 1980 FORECASTS

(*thousands of tons*)

Shipments to:	1954		1980	
	Tons	Percentage	Tons	Percentage
United States.....	1,670	76.6	3,669	75.2
United Kingdom.....	271	12.4	634	13.0
Commonwealth countries.....	3	0.1	—	—
Other European.....	101	4.6	315	6.4
Central and South America.....	60	2.8	120	2.5
Asia, Africa and the Far East.....	75	3.5	143	2.9
Total.....	2,180	100.0	4,881	100.0
Dissolving pulp for domestic use.....	61		165	
	2,241		5,046	

Recapitulation of Total Pulp and Paper Demands

Prospective demand trends for each of the main sectors of the industry have now been set forth. In some instances it has been possible, or the importance of the commodities in question has made it desirable, to build up the forecasts in considerable detail; in others, in which the tonnages involved have been relatively small or information has been lacking, only rough and arbitrary estimates were made. The results are estimates of uneven quality and of varying reliability, if this term can be applied at all to forecasts ranging a quarter of a century ahead.

The recapitulation of the estimates is given in Table 59 and in Figure 23. Both must be read with all the uncertainties and limitations which attend such future estimates kept in mind.

Wood pulp and pulpwood requirements might be viewed as two common denominators measuring over-all industry growth. They indicate that slightly more than a doubling—actually, a 110% increase—of total wood pulp capacity and of pulpwood requirements will be necessary over the next 25 years

in order to meet the various demand trends which have been projected. Relatively, this increase is smaller than any past increase. Between 1929 and 1955, roughly the last 25 years, total pulp production rose from just over four million tons to an estimated 9.9 million tons, thus making a gain of almost 150%. But in tonnage terms, the projected increase to 1980, shown in Table 60, exceeds those of all past periods.

Table 59

RECAPITULATION OF PROSPECTIVE DEMANDS ON CANADA BY PRINCIPAL GRADE CLASSIFICATION, 1960 TO 1980

(*thousands of tons*)

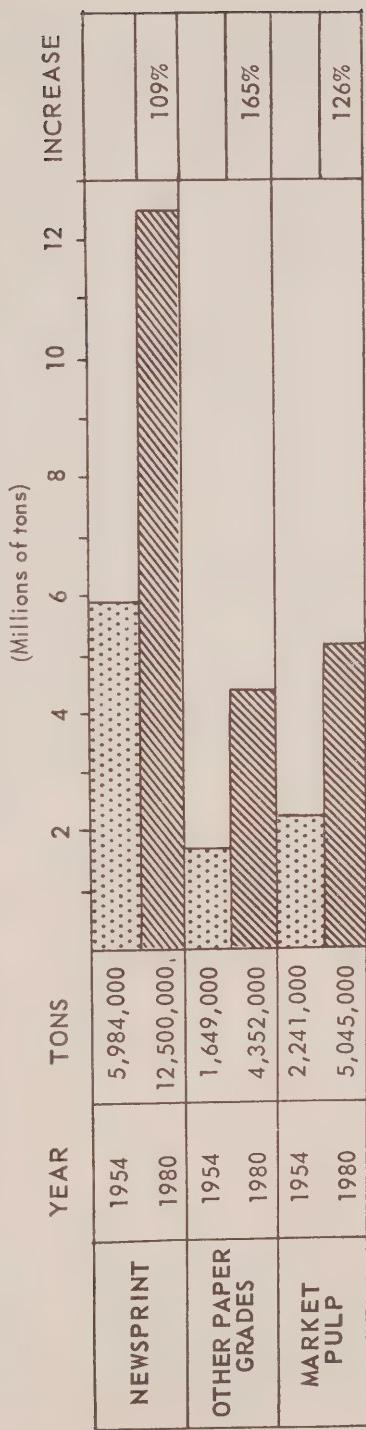
Year	Newsprint	Book, writing and groundwood	Paper- board	Building boards and papers	Wrapping	Tissue and sanitary	Market pulps
1960.....	7,100	325	1,050	290	317	119	2,894
1965.....	8,300	387	1,265	348	368	140	3,392
1970.....	9,700	458	1,540	412	418	161	3,926
1975.....	11,000	539	1,840	488	469	182	4,420
1980.....	12,500	634	2,180	575	515	203	5,045

The increase in pulpwood requirements indicated in Table 60 on page 142, is a maximum, given the projected increase in pulp and paper output. A probable increase in the use of hardwoods in pulping, some increase in pulp yields per unit of pulpwood and some degree of substitution of groundwood pulp for chemical pulp in certain paper grades (especially newsprint), should all operate to reduce pulpwood requirements per unit of end product. In view of these factors, the industry's pulpwood requirements may be taken as 25 to 28 million cords annually by 1980.

If wood pulp production is to reach 20.7 million tons by 1980, about 430,000 tons of new pulp capacity will have to be added, on the average, each year. Precisely this rate of increase in production has been achieved in the ten years since the war, but there is an important difference. Between 1945 and 1946 production rose by one million tons but much of this increase came from capacity which had been kept idle during the war years because of manpower and material shortages. With the industry now operating at full capacity, all future expansion must come from additions to plant and equipment.

We have been concerned in the foregoing with what might be called the "demand" outlook for Canada's pulp and paper products. But the addition of more than ten million tons of capacity, plus new machine capacity to convert the pulp into newsprint and other pulp and paper products, will impose heavy demands in terms of manpower, capital and wood requirements. These are discussed in subsequent chapters. However, a few further observations relating to the supply aspects may be mentioned here.

CANADIAN PULP AND PAPER PRODUCTION BY MAIN GRADES, 1954 AND PROJECTED 1980



Newsprint Association of Canada

Figure 23

Table 60

**CONVERSION OF PRODUCT REQUIREMENTS INTO WOODPULP AND
PULPWOOD EQUIVALENT, 1980**

(woodpulp: thousands of tons; pulpwood: thousands of cords)

	Production 1954	Estimated production 1980	Increase over 1954	(factor)	Pulp equivalent	(factor)	Rough cords wood equivalent
Export pulps	2,175	4,880	2,705	104	2,705	(1.90)	5,100
Dissolving pulps consumed in Canada.....	61	165	104	104	(2.20)		230
Newsprint	5,984	12,500	6,516	(1.02)	6,650	(.95)	6,250
Paperboard	799	2,180	1,381	(.60)	830	(1.85)	1,530
Building boards and papers	227	575	348	(.25)	90	(1.40)	125
Book, writing and groundwood	269	634	365	(.90)	330	(1.90)	625
Wrapping	250	515	265	(1.00)	270	(1.90)	510
Tissue, sanitary and specialties	103	203	100	(1.20)	120	(1.90)	230
Total	9,868	21,652	11,784		11,099		14,600
							Rough cords
Total pulp production 1954.....					9,626		13,677
Increased requirements through to 1980					11,099		14,600
Estimated total pulp production required in 1980					20,725		28,277

a See Chap. 4 for detail on building boards.

In the attainment of the demand forecasts which have been set forth it is, of course, obvious that cost and price trends will be of critical importance. Clearly, if pulp and paper prices increase in relation to the prices of other things—and particularly in relation to substitute materials—consumption of pulp and paper commodities will be retarded. Moreover, since Canada is a major exporter of newsprint and pulp, the demand for Canadian pulp and paper products will be retarded if Canadian costs of production rise in relation to competitors' costs. It has been implicitly assumed that in the long term neither of these things need occur.

It will be recalled that the first of these assumptions—that no relative price increase need be expected for pulp and paper—is at variance with the price assumption made for lumber (see page 47). There are important reasons for this. It is expected, first, that for certain grades of lumber a prospective scarcity and/or the need to open up remote areas to obtain preferred grades may induce relative price increases. For pulp and paper, whose wood needs are more flexible in terms of species and sizes, these pressures should not develop. Thus in the later chapter on prospective logging costs, it will be seen that while a relative price increase is expected for pulpwood, it is somewhat lower than that expected for sawtimber. Secondly, notwithstanding rising pulpwood costs, pulp and paper prices are expected to maintain their relative position through technological progress and, related to this, rising productivity. Here again the prospect is more favourable for pulp and paper than for lumber. It is assumed that the higher degree of fabrication performed in converting wood into pulp or paper presents more scope for manufacturing economies.

The assumption that Canadian costs of production—and therefore prices—need not rise in relation to those of competitors is an important condition to the achievement of the newsprint and market wood pulp growth which has been indicated. Canada has been able to build a major industrial enterprise geared largely to requirements which lie outside its borders. Currently, out of a gross value of production of \$1.3 billion, roughly one billion dollars worth of output is exported. This enterprise was based on an economic advantage which stemmed from the particular combination of our forest and water resources. It is perhaps necessary, and certainly desirable, however, that we Canadians be reminded that there is no longer anything unique in our situation.

As recently as World War II a case might have been made, particularly as regards newsprint, for the "unique" resources argument. By since then technical innovations or improvements have made possible many new developments abroad. There has been, for example, the growth of a sizable newsprint industry in the United States South. New pulp and paper industries, including newsprint, have been established in Australia and New Zealand. New techniques have brought the pulping of hardwoods not only

to Canada, but to other countries as well, thus opening up new regions or giving new life to old. Finally, technology now promises the feasibility of using a much wider range of raw materials and, in addition, will bring power at a not unattractive cost to areas without natural power resources.

These developments do not mean that Canada's advantage in pulp and paper manufacture has been lost but that it has narrowed. We have seen this in the expansion of the southern United States newsprint industry. Twenty-five years ago this growth could not have occurred; but, as just noted, it has come about through improvements in technology. Thus, literally, the narrowing of a production advantage results in a geographical narrowing of the market. Now it is true, as the analysis on pages 114 to 116 has indicated, that this expansion in the South has been associated with a rapidly growing regional market; thus the advantage is, in a sense, temporary. The typical industrial pattern which follows the opening of a new resource region may be expected: rapid expansion to the point where rising resource and production costs make further growth unattractive.¹⁴ Clearly, however, this cost margin is relative; it will be determined by the cost-price relationships which prevail.

This is only another way of saying that expansion will occur where the investment required is economically attractive. On the assumption which has been made—namely, that pulp and paper costs need not rise relatively—it is expected that prospective world pulp and paper demand trends will be as indicated and that the Canadian industry, in turn, will share in these demands to the extent that somewhat more than a doubling of output is in prospect.

¹⁴The operation of this process, in part, is to be seen in a rapid appreciation of forest land values in the South. For the longer term, competition for available wood by competing users is also a factor. For example, in *America's Demand for Wood* (Stanford Research Institute, 1954), United States newsprint demand is expected to increase by about 43% between 1952 and 1975. Demand for other grades of paper and paperboard shows an estimated increase of 95%. Paperboard and coarse paper, in which southern pine is widely used, are expected to show increases of 106% and 61% respectively. It may be inferred that competition for wood for these other grades will be strong.

OTHER FOREST PRODUCTS

THE TWO previous chapters have had to do with the prospects for lumber and allied products and pulp and paper. Several other forest products, which in the period 1951 to 1953 accounted for 20% of the wood produced in Canada, must also be considered. These are pulpwood exports, fuelwood, Christmas trees and miscellaneous roundwood products (poles, piling, mine timbers etc.).

Pulpwood Exports

Canada exported an average of 2.2¹ million cords of pulpwood annually during the period 1950 to 1954.² This volume amounted to 15% of total pulpwood production in that period. Exports of pulpwood have expanded gradually over the years as shown by Table 61. However, the proportion of production which has gone to export markets has declined. In the period 1910-14, exports accounted for more than one-half of production.

Table 61

CANADIAN PULPWOOD EXPORTS AND PERCENTAGE OF TOTAL PRODUCTION, 1910-54

Years	Exports (thousands of cords)	Percentage of production
1910-14.....	956	51.7
1915-19.....	1,091	35.5
1920-24.....	1,213	29.6
1925-29.....	1,437	24.4
1930-34.....	930	18.0
1935-39.....	1,468	21.1
1940-44.....	1,641	18.4
1945-49.....	1,986	16.2
1950-54.....	2,233	15.0

¹All volumes are expressed in rough cords of 85 cubic feet.

²In addition, pulpwood chips manufactured from sawmill left-overs are exported. The quantity was the equivalent of 261 thousand rough cords in 1954 and 361 thousand cords in 1955. Although in the short term exports of pulp chips may increase, it is expected they will later fall off to a negligible amount.

The United States is by far the most important export market for pulpwood, shipments to the United States in the period 1950 to 1955 being over 80% of the total. The United Kingdom took just under 10% and the balance went to several European countries.

Ontario, New Brunswick and Quebec, in that order, were the leading sources of export pulpwood in the past 5-year period, providing 75% of the total. The three Prairie Provinces shipped 8% and British Columbia 10%. Nova Scotia, Newfoundland and Prince Edward Island provided the remainder.

The pulpwood export business is well established, and the bulk of shipments is a movement of wood to the most economically attractive markets. There are, however, extraordinary shipments which occur in years of peak demand when foreign mills find it necessary to augment normal supplies with marginal purchases from Canada. This has resulted in wide short-term fluctuations in the volume of exports: from 1950 to 1951 exports increased by 62% and by 1953 had returned to the 1950 level. Prices received for export pulpwood also fluctuate widely.

In considering possible future exports, the demand for Canadian pulpwood in foreign countries must be taken into account. Most long-term projections indicate a considerable expansion of the United States pulp and paper industry. However, the demand of United States mills for Canadian pulpwood is not expected to increase in the same proportion. The bulk of United States expansion must, on the basis of wood availability, take place in the South, the West and the Lake States region. Such expansion as does take place in the northeastern United States, the main pulpwood importing region, will be based to some extent on hardwood pulpwood. In the Lake States region, it is expected that expansion of production can be based on domestic wood. As Canadian domestic needs grow, it will be less advantageous for United States producers to draw supplies from Canada.

It would appear that the demand from overseas markets should be maintained. The principal overseas market, the United Kingdom, is without appreciable forest resources, and western European countries are net importers of pulpwood. The alternatives for these markets are to switch to other sources of pulpwood or to substitute other types of fibre. Northern European countries are likely to use more of their available wood rather than to increase exports of pulpwood. Soviet Russia could become a major pulpwood exporter but whether this will happen is uncertain. Substitution of other fibres may take place to some extent, but conventional wood fibre will likely be needed to achieve desired pulp and paper qualities. Thus, while pulpwood might fall as a proportion of fibre input, the absolute level of pulpwood consumption is unlikely to decline.

As to the outlook for the supply of pulpwood for export, two points are important. First, there has been relatively little direct competition between domestic and foreign users of pulpwood up to now (with the exception of years of extraordinary external demand). Second, it is expected that domestic pulpwood requirements will about double over the next 25 years. Some areas which now export pulpwood may experience domestic needs which could reduce the supply of pulpwood for export. Ontario, British Columbia and New Brunswick are in this category. On the other hand, there are areas which could be developed for the export of pulpwood should the demand increase. Labrador, parts of Quebec and the region served by the Hudson Bay Railway are areas where this could take place. The results of these forces will likely mean a decrease in exports from the recent average level of 2.2 million cords a year to an average level of 1.6 to 1.9 million cords a year or, say, 1.75 million cords a year by 1980.³ There is, however, every prospect that there will continue to be wide short-term fluctuations in shipments and prices.

Fuelwood

It is estimated that 4 million cords of fuelwood were cut from standing timber in Canada in 1954. In addition, the equivalent of about 1.3 million cords of slabwood, hogged fuel and sawdust were sold by sawmills, the last mentioned being produced from the left-overs of the manufacturing process. A further quantity of wood was used for fuel by the sawmill industry, the wood used being the waste of the particular mills that produced it. There are no estimates available of the quantity of wood in this category.

Consumption of fuelwood in Canada is currently much lower than in former years. In 1950 for example, production of fuelwood from farm wood-lots, the main source of fuelwood, was half what it was in 1940. The chief reason for the decline has probably been the desire of consumers for more convenient fuels and the increase in recent years in the supply of petroleum fuels. The development of bottled fuels has meant that rural areas, as well as urban areas, can be served efficiently with the newer fuels. Studies of fuel resources prepared for this Commission have indicated that, in the future, wood will constitute a less important percentage of the fuel supply. Consumption of wood fuel in Canada by 1980 (not including wood burned at producing mills) may be in the neighbourhood of 2.5 million cords, compared with about 5.3 million cords in 1954. Part of the fuelwood will be supplied from standing timber and part from sawmill left-overs. It is difficult to say what percentage may be supplied by each of these two sources, but for this study it is assumed that 2 million cords will be from standing timber and 0.5 million cords from mill left-overs.

³The Stanford Research Institute estimated United States net imports of pulpwood in 1975 to be 1.3 million cords (*America's Demand for Wood*, p. 58). The United States Forest Service estimated United States net imports of pulpwood in 1975 to be 2 million cords (*Timber Resource Review*, Chap. VI, p. 112).

Miscellaneous Products

The production of miscellaneous forest products in Canada (poles, piling, fence posts and rails, round mining timber, distillation wood and hewn ties) accounts for a very small part of Canadian wood utilization. It is estimated at 64 million cubic feet for 1954. For the same year exports of these products are reported to have amounted to 15 million cubic feet, so that apparent consumption in Canada was 49 million cubic feet.

There is no detailed knowledge of past trends in the consumption of these products in Canada. In the future, the demand for some of these products will increase. For example, there will probably be more poles used as electrification continues and replacements are needed. On the other hand, there will likely be some displacement of this group of products by other materials. Since it is not possible with the information available to make detailed estimates of future consumption of these materials, only an arbitrary estimate can be given. It is assumed that consumption of this group of products in Canada in 1980 will require 55 million cubic feet of wood.

Exports, in addition to the quantity already referred to, included about 10 million cubic feet of logs and 1 million cubic feet of fuelwood, for a total of 26 million cubic feet of miscellaneous roundwood products. The largest item in this group was mine timbers shipped to the United Kingdom.

The volume of exports of these products has decreased greatly over the years. In particular, exports of logs have in recent years, been only about 15% of the level of the late 1920's. It is expected that exports of logs will decrease further in the future. It may be expected that exports of the other products will continue at about the level of recent years. Here again a precise estimate is impossible, and it is assumed that the level of exports in the year 1980 will be about 25 million cubic feet. Exports of these products in 1954 were valued at \$10.5 million, and approximately the same revenue may be expected in 1980.

Summary

Conversion of estimates for 1980 to cubic feet would give a total of 389 million cubic feet made up as follows: pulpwood exports, 149 million; fuelwood, 160 million; consumption of miscellaneous roundwood products, 55 million; exports of miscellaneous roundwood products, 25 million. This includes 40 million cubic feet of sawmill waste used as fuel.

There is a certain volume of wood cut for local use which does not appear in commercial trade. There is no information on the quantity of wood so used. Some of this wood is cut from non-commercial stands. Since it is unlikely that changes in the pattern of use of this wood will have any effect on the Canadian economy, these uses may be ignored for purposes of this study.

In addition to these products Canada's forests provide income from the so-called minor forest products—maple sugar and syrup, Christmas trees and gums and resins. The value of exports of this group in 1955 was \$12 million, including \$5.8 million in Christmas trees and \$5.5 million in maple products. It is not possible to make detailed estimates of future markets for these products, but because of the favourable supply situation of Canada and the growing market in the United States, it would seem reasonable to expect increased exports in the future.

TOTAL PROSPECTIVE DEMAND FOR WOOD

IN ORDER to compute the total quantity of wood that will be required to meet the estimated demand, it is necessary to convert all the products to a common basis. They are consequently reduced to the basis of cubic foot of merchantable timber¹ in accordance with factors currently used by the Dominion Bureau of Statistics and the Forestry Branch, Department of Northern Affairs and National Resources. In addition, however, changes in utilization practices, particularly in the further use of left-overs from the processing industries, must be taken into account. The converting factors for lumber and other sawn products are the ones most likely to change. For this reason, the calculation of merchantable timber needed for lumber and sawn products is shown as an appendix to this chapter.

One of the most important changes that may be expected is in the use of sawmill residues. In 1954 sales of pulp chips, slabs and edgings, sawdust, hogged fuel and other "waste" by the lumber industry were equivalent to 2,255,000 cords. In addition, mill residues were provided by the veneer and plywood industry and other wood-using industries. Of this left-over material 695,000 cords were used by the pulp and paper industry in Canada and 261,000 cords were exported in the form of chips. Of the remainder, a small percentage was probably sawn into small dimension products. Most of it, probably about 1,300,000 cords, was sold for fuel. The left-over material used by the pulp and paper industry amounted to 5% of all wood used by that industry in 1954.

It is estimated that in 1980 production of pulpwood chips from sawmill left-overs may be about 3 million cords. This is based on production of sawn products of 12.2 billion board feet, a resulting theoretical total production of chipable material of 6 to 8 million cords and an assumption that about one-half of this amount could be economically available to the pulp and paper industry. This anticipates the development of machinery and techniques for using left-overs from small and medium-sized sawmills which have not pro-

¹Merchantable timber—The volume of trees four inches and more in diameter at breast height, exclusive of the volume in the tops and stumps.

TOTAL PROSPECTIVE DEMAND FOR WOOD

duced chips successfully up to now. Additionally, it anticipates the building of pulp and paper mills in locations where advantage can be taken of this potential source of supply.

The actual amount of left-overs that will be used in the future depends, of course, on the wood supply picture. If certain mills are faced with a tight supply of wood from standing timber, they may draw these left-over materials from greater distances. On the other hand, if wood supplies prove ample, less than the assumed amount may be used. The figure of 3 million cords of left-overs would seem to be a reasonable assumption, with the proviso that a greater quantity could be used if needed. The demand for fuel-wood from wood waste, however, is expected to decrease and may amount to 500,000 cords.

Estimated requirements by use are shown in Table 62, which indicates that if the demand estimates for 1980 are to be met, about 4,900 million cubic feet of merchantable timber will have to be logged. A similar calculation for 1954 shows that 3,100 million cubic feet of timber were used,² so that the 1980 calculated cut of timber is 58% greater than the 1954 cut. This, however, does not mean that 58% more growing stock, as measured by present inventories, will have to be cut. Improvements in logging utilization may be expected, and this aspect is discussed farther on in connection with management.

Table 62

WOOD REQUIREMENTS IN 1980 COMPARED WITH PRODUCTION IN 1954

	Commercial units		Millions of cubic feet of merchantable timber	
	1954	1980	1954	1980
Wood for domestic pulp and paper industry (M cords)	13,677	28,000		
of which:				
Pulpwood (M rough cords)	12,982	25,000	1,100	2,120
Mill left-overs (M cords)	695	3,000		
Logs for lumber and other sawn products (million f.b.m.)	7,317	11,400	1,400	2,220
Logs for softwood plywood and veneer (million f.b.m.)	235	700	40	130
Logs for hardwood plywood and veneer (million f.b.m.)	93	150	20	30
Pulpwood exports (M rough cords)	1,861	1,750	160	150
Fuelwood				
Roundwood (M cords)	3,918	2,000	310	160
Mill left-overs—(M cords) ^a	1,300	500		
Miscellaneous roundwood consumed in Canada			50	55
Exports of miscellaneous roundwood			25	25
Total			3,105	4,890

^a Mill left-overs sold by the lumber industry minus "other wood" purchased by the pulp and paper industry and the export of pulp chips.

²There is no complete census of timber cut in Canada. The foregoing estimate for 1954 is built up by taking wood consumed by industries and converting it to cubic feet of merchantable timber. A separate study of timber cut by provinces carried out by the Commission staff and based on annual reports of provincial governments gave an estimate of the cut which was very close to the foregoing figure. It is understood that the Dominion Bureau of Statistics is currently revising estimates of timber cut. These revised estimates may be different from the estimates used in this study.

This matter of timber requirements must be approached with caution. The total is shown in terms of timber, with no regard for species or size. For instance, production of logs for plywood and veneer in 1954 was 60 million cubic feet, and the estimated cut for 1980 is 160 million cubic feet, an increase of 170%. Thus the percentage increase in veneer log production is much greater than that for total wood production.

The increase in requirements for pulpwood and logs is offset in part by decreased fuelwood cut. However, the stands from which fuelwood is now cut and the type of trees cut for fuelwood may not be suitable for the other products at present. Over the long term, sawlogs and pulpwood could be produced from land now supporting fuelwood if a sufficient effort were made to grow them.

A further matter is the proportion of softwoods to hardwoods. It is estimated that 88% of the timber cut in 1954 was softwood and 12% was hardwood. Most of the hardwood was used for fuel, but hardwood is also used for lumber, pulpwood and plywood.

It is expected that hardwood will make up a greater percentage of pulpwood and logs in the future. In 1954 about 5% of the pulpwood used by Canadian industry was hardwood. The increasing use of hardwoods for building papers and building boards, corrugating media and other products, as well as the possibility of using some hardwood for newsprint, suggests that a higher proportion of the pulpwood cut in 1980 could be hardwood. Hardwood lumber has been about 7% of total production in recent years, and for this too an increasing percentage of production is possible.

The relative abundance of hardwoods in Canada will act as a spur to their greater use. However, because export demands for lumber are for softwoods, and because newsprint, for which softwoods have important technical advantages, is a large proportion of Canadian pulp and paper output, it cannot be expected that hardwood will make up a very large percentage of the wood cut. On balance, increasing industrial use substantially offset by declining fuelwood use, may result in hardwood making up about the same percentage of production as it does today.

It is interesting to note that if the utilization by the pulp and paper industry of chips from left-over materials and of hardwoods develops in the pattern already suggested, the requirements of the pulp and paper industry could be met with an 80% increase in softwood pulpwood consumption, compared with an expected increase of 105% in the total quantity of wood used by the pulp and paper industry.

In addition to the over-all proportion of softwoods to hardwoods, the availability of certain species is important. In the past, certain species have been favoured over others, and this has resulted in the production of a

species mix different from the occurrence of the species in the forest. Thus, by reason of varying economic availability, it is likely that the species composition of Canada's output will change in the future. Douglas fir will make up a smaller percentage of the lumber cut in British Columbia. In some other parts of Canada, the jack and lodgepole pines will likely make up a larger percentage of lumber output. These changes may be taken in stride, but it must be realized that some marketing and technical problems will have to be overcome.

For particular products, minimum size and quality of raw materials are required. Plywoods are most exacting in this regard, and a comparison of total timber needs with resources will not indicate the adequacy of resources for plywood. Much the same situation exists for the lumber industry, but the qualities required for lumber are not as high as for plywood.

In summary, and with all the qualifications necessarily attendant on projections of this kind, the demand estimates given in previous chapters could be met with a cut of timber of 4,900 million cubic feet. Canadian industry will need about 2,400 million cubic feet for sawlogs and veneer logs and will use 2,100 million cubic feet as pulpwood. Fuelwood, pulpwood exports and other miscellaneous products will account for the remainder.

Appendix to Chapter 6

Calculation of Timber Requirements for Production of Lumber and Other Sawn Products in Canada in 1980

It is assumed that production of lumber and sawn products in 1980, all expressed in billions of board feet, will be as follows:

	Billions of board feet
Lumber production	11.6
Shingles2
Miscellaneous sawn products—ties, hardwood squares, shooks, staves . . .	<u>.4</u>
	12.2

In translating this quantity of products into timber, in 1980, possible changes in utilization factors must be considered. The Dominion Bureau of Statistics' records indicate that to produce 1,000 board feet (mill tally) of sawn products it required 933 board feet of logs in 1952 and 934 board feet of logs in 1953. (Alternatively, the overrun was 7.1% and 7% respectively.) This is in terms of the sum of the various quantities of logs used, each expressed in the local log rule by which the products were measured, or a sort of "average log rule". There are several log rules used

in Canada, and a change in the percentage of logs reported by the different rules would result in a different factor. In 1980, the percentages of logs scaled by the various rules will be different from what they are at present. For purposes of this calculation, however, volumes are expressed in terms of the same "average log rule" as in the above data.

The yield of products per thousand board feet of logs used could change in the future. Currently, from about 15% to 18% of a log sawn is converted to sawdust. It can be expected that with improved machinery this percentage could be reduced somewhat in the future. The introduction of recovery equipment would give reason to expect some reduction in the percentage of the log going to slabs and edgings. It would not be unreasonable to expect the yield of lumber and its by-products per thousand board feet of logs (of a given mix of diameters) to be 5% greater in the future than at present.

In converting sawlogs to merchantable timber, the factors now used by the federal government are 175 cubic feet per thousand board feet for the coast region of British Columbia and 200 cubic feet per thousand board feet for the rest of Canada. The converting factors applicable in the future could be different. A shift to the use of smaller logs would mean a larger cubic-foot volume of timber per thousand board feet log scale (and also per thousand board feet of lumber production). In some parts of Canada there will probably not be a shift to the use of smaller logs. However, it is very likely that, the Canadian lumber industry being taken as a whole, the average size of logs sawn will be smaller than at present.

Thus there are two tendencies which may influence cubic-foot requirements per unit of end products—closer utilization in the mills and the use of smaller logs. It is assumed that these two trends will be mutually offsetting and that the conversion factors already used can be applied to convert product output to timber for 1980.

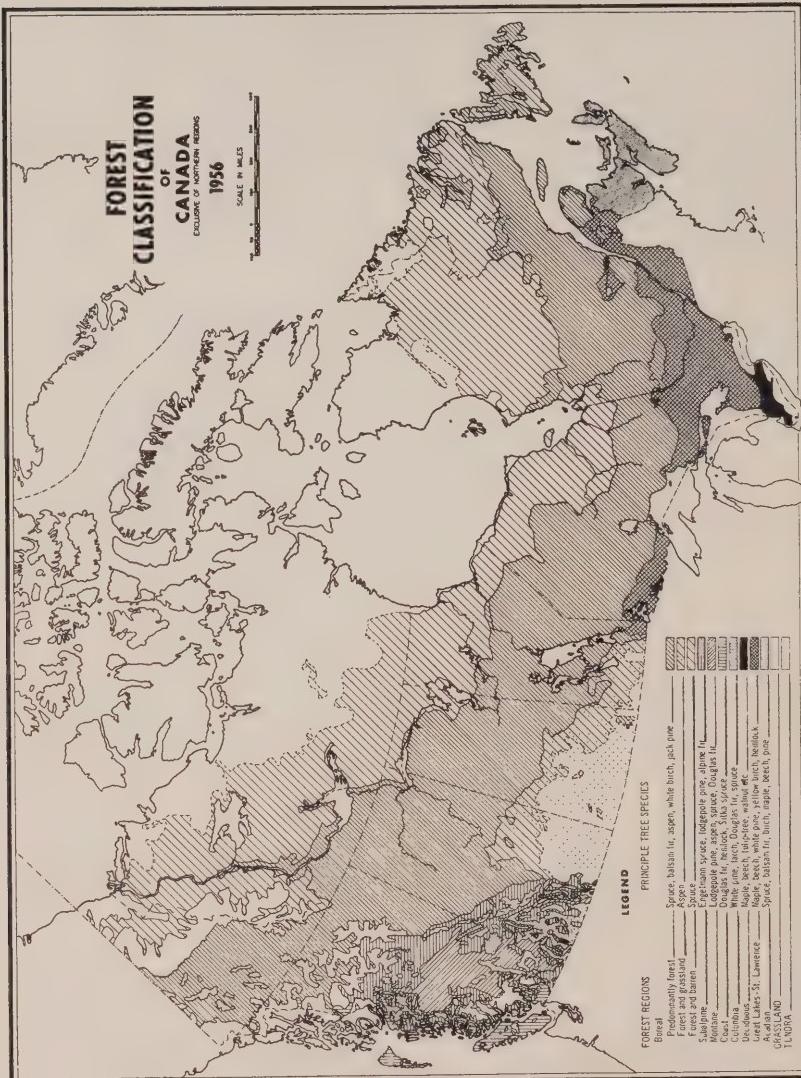
The foregoing utilization factor (930 board feet of sawlogs per thousand board feet of sawn products) and an equivalent sawn product output of 12.2 billion board feet, gives a sawlog consumption in 1980 of 11.3 billion board feet. For purposes of conversion to timber it is assumed that 3.3 billion board feet may be converted at 175 cubic feet per thousand board feet and 8 billion board feet at 200 cubic feet per thousand board feet. The total sawlog production may thus be expressed as 2,177 million cubic feet of merchantable timber. To this must be added 120 million board feet of logs used by secondary manufacturing industries or an additional 20 million cubic feet, to bring the total to 2,197 million cubic feet, or a rounded total of 2,200 million cubic feet.

An alternative calculation may be made through the use of factors derived from studies by the Forest Products Laboratories of Canada. Mill studies indicate that for the coast of British Columbia, 1,000 board feet of

logs (British Columbia log scale) contain 163 cubic feet of solid wood.³ A study of lumber production in 60 sawmills in eastern Canada indicates that the average cubic volume of logs used for the production of 1,000 board feet of lumber was 176 cubic feet in softwood and 189 cubic feet in hardwood.⁴ If the lumber cut is allocated 3.3 billion board feet from the coast region of British Columbia, 8 billion board feet of softwood from the rest of Canada and 0.9 billion board feet of hardwood, the calculated cubic volume of wood is 2,100 million cubic feet of logs. This volume of logs will require the cutting of about 10% more timber to allow for inevitable losses in logging. The equivalent total would thus be roughly 2,300 million cubic feet of sound merchantable timber.

³Average of Douglas fir and western hemlock. (*Forestry Branch Bulletin*, No. 109, p. 14.)

⁴*Forestry Branch Bulletin*, No. 99, p. 10.



Forestry Branch, Department of
Northern Affairs and Natural Resource

Figure 24

THE PROSPECTIVE SUPPLY SITUATION

The Resource

Canada's vast forest area of one-and-one-half million square miles, extending west and northwestward from Newfoundland on the Atlantic coast to British Columbia and the Yukon Territory on the Pacific, covers more than two-fifths of the total land area of the country. The commercially productive forest alone makes up almost one-quarter of the total. Figure 25 shows the distribution of forest lands according to accessibility and ownership.

To the average Canadian the forest stretches unbrokenly as far as the eye can see from the train window or the motor highway. He sees it as mile after mile of softwoods, or endless ridges of poplar or birch. Actually, it is neither of these, but a multitude of tree associations varying widely in age and density, in diameter and height, from the mature stands of merchantable timber to the recently cut-over areas already partially stocked with seedlings and saplings. A century or more of repeated fires, successive cutting operations on the same areas, and insect and disease epidemics has left the forest as we have it today—a complexity of types, each requiring its own particular form of management. The forest is dynamic in nature, reproducing itself (though not necessarily with what is considered at the time the most valuable species) in spite of repeated cutting operations and epidemics of insects and disease. Only when successive fires have destroyed the productive capacity of the soil and the available seed source, does the forest land revert to barrens or even to bare rock for many years to come. It is this ability of the forest resource to renew itself that makes possible the continued existence of the forest industries.

The many variations that occur in soil and climatic conditions result in wide differences in the character of the forests. These differences are recognized in the designations of eight forest regions, known as the Acadian, the Great Lakes-St. Lawrence, the Deciduous, the Boreal, the Subalpine, the

Columbia, the Montane, and the Coast Forest Regions.¹ These regions are described briefly below, and their boundaries are outlined in Figure 24 on page 156.

¹See Halliday, W. E. D., *A Forest Classification for Canada*, Canada, Department of Mines and Resources, Forest Service Bulletin 89, 1937.

DISTRIBUTION OF LAND AREA IN CANADA

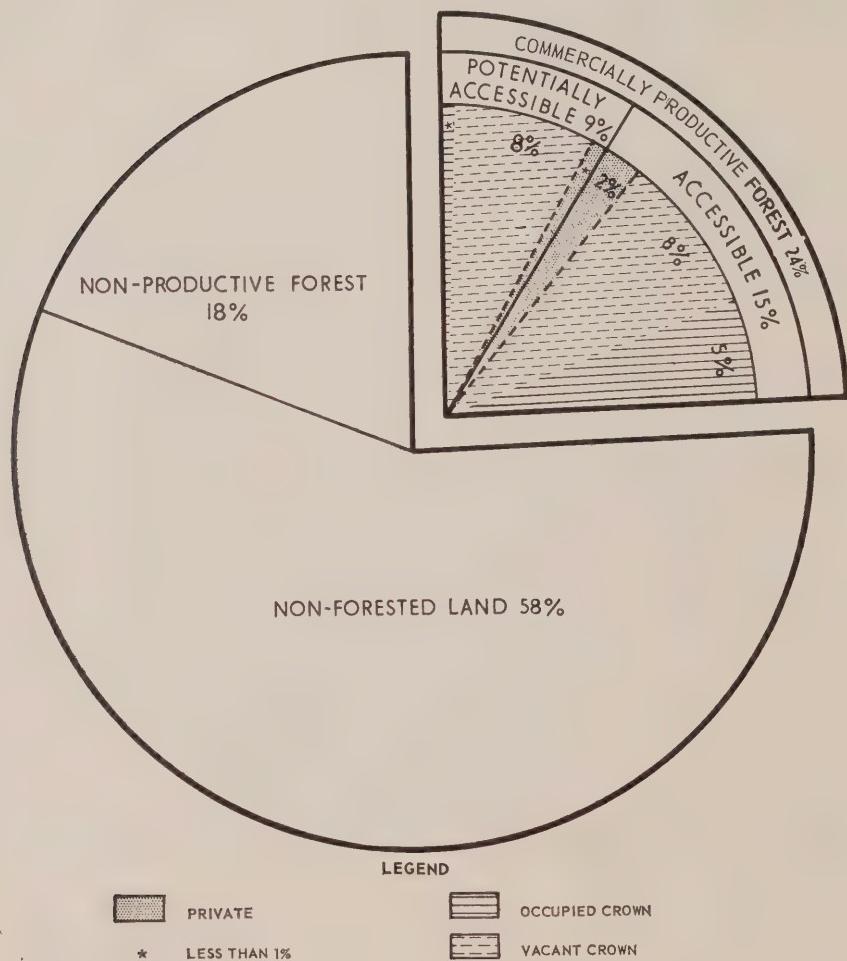


Figure 25

- (1) *Boreal Forest Region*—This region, making up 80% of the total of all regions, stretches from the Atlantic Ocean to the Rocky Mountains and Alaska. Although the region is primarily coniferous, with white and black spruce, tamarack, balsam fir, jack pine and lodgepole pine and alpine fir, there is a general admixture of broadleaved trees such as the white birches and poplars, which play an important part in the central and south-central portions of the region.
- (2) *Great Lakes-St. Lawrence Region* — The St. Lawrence River Valley and the area adjacent to the Great Lakes contain a mixed forest dominated by the white and red pines, hemlock and yellow birch. Associated with these are the sugar and red maples, red oak, basswood, eastern white cedar and largetooth aspen. Boreal species intrude from the north; and in the east, red spruce from the Acadian Forest.
- (3) *Acadian Forest Region*—The characteristic species of this region is red spruce, with which are associated balsam fir, yellow birch, sugar maple, red and white pines, beech and hemlock. The black and white spruces, red oak, white elm, white and wire birches, and the poplars are also widely distributed. The greater part of the Maritime Provinces is included in this region.
- (4) *Deciduous Forest Region*—This region, a small northerly extension of a widespread region in the eastern United States is the one area in Canada dominated by hardwood species. It occurs in southwestern Ontario, bordering on Lakes Huron, Erie and Ontario. The principal species are sugar maple, beech, white elm, basswood, white oak and butternut. Occurring also, though in less prominence, are the tulip-tree, the cucumber-tree, papaw, red mulberry, the Kentucky coffee-tree, redbud, and black gum.
- (5) *Coast Forest Region*—The area west of the Coast Ranges and the Cascade Range, including the islands lying off the coast, comprises this region. Its coniferous stands include the largest species of trees in Canada — Douglas fir, western hemlock and western red cedar, and Sitka spruce. Yellow cedar, western white pine, and amabilis fir also have wide distribution.
- (6) *Montane Forest Region*—This region forms a large part of the Interior Dry Belt of British Columbia at elevations generally below those of the Columbia Region. Typical species are ponderosa pine, Douglas fir, lodgepole pine and trembling aspen. In the northern part of the region the ponderosa pine is replaced by Engelmann spruce and alpine fir.

- (7) *Columbia Forest Region*—Most of the Kootenay River Valley, the upper valleys of the Thompson and Fraser Rivers, and the Quesnel Lake area of British Columbia form this region, often referred to as the Interior Wet Belt. It is characterized by the presence of western red cedar and western hemlock, with which are associated Douglas fir, western white pine, western larch and grand fir.
- (8) *Subalpine Forest Region*—This forest occurs on the upper slopes of the mountains east of the Coast Ranges in British Columbia and on the lower slopes of the Rockies in Alberta. It lies between the Alpine tundra and the Montane Forest Region and is a coniferous forest. The dominant species are Engelmann spruce, alpine fir and lodgepole pine. The white and black spruces and aspen intrude from the boreal forest to the north.

Forest Classification

The compilation of forest inventory statistics from 11 forest authorities presents problems of classification and terminology. The fact that certain differences in terms do exist between provinces makes it necessary to define as clearly as possible those used in this study.

- (1) *Accessible Forest*—Land classed as forest, comprising lands which are now suitable for economic exploitation as a source of usable timber but which may also contain immature forests and areas recently cut over, and comprising also non-productive (non-commercial) forest lands lying within the accessible region.
- (2) *Potentially Accessible Forest*—Land classed as forest which is not yet within reach of economic exploitation as a source of usable timber, owing to lack of transportation facilities or the existence of physical barriers such as difficult terrain. It includes also non-productive (non-commercial) forest areas lying within the region.
- (3) *Reserved Forest*—Forest land reserved or dedicated by legislative enactment and thus closed to exploitation for timber production. This comprises those national and provincial parks and other forest areas where cutting operations are prohibited.
- (4) *Commercially Productive Forest*—Unreserved forest land now producing or capable of producing stands of usable timber. It includes young growth of all ages and degrees of stocking, as well as timber of commercial size.
- (5) *Non-Productive (Non-Commercial) Forest*—Forest land which is incapable of producing stands of usable timber because of adverse site conditions, or which is classed as reserved forest.

- (6) *Occupied Forest*—Commercially productive forest which is in private ownership or has been leased from the Crown for cutting purposes. These areas are not necessarily under production, and may occur in the potentially accessible forest areas.
- (7) *Allowable Cut*—The volume of wood which can be cut, under management, for a given period.

Forest Ownership

The historical development of forest ownership and tenure patterns in Canada has been described in Chapter 3. More than 90% of the Canadian forest area is now owned and administered by either the provincial or the federal governments. In the Maritime Provinces, however, most of the forest is under private ownership: the government of Prince Edward Island owns practically no forest land; in Nova Scotia, three-quarters of the forest is in private holdings; in New Brunswick, one-half of the forest area is Crown land; and more than 80% of the Newfoundland forest area is government-owned. But in the remaining provinces less than 10% of the forest area is under private ownership.

With the exception of the Yukon and the Northwest Territories and relatively small areas such as national parks and Indian and military reserves, the Crown forests are administered by the provincial governments. Each provincial forest service has its own forestry laws and regulations, which are remarkably similar from coast to coast, although many regulations have been drawn up to meet local conditions. This system carries with it a responsibility on the part of each provincial forest organization to formulate policies aimed at the development of its forests to the greatest possible extent under economic conditions.

Resource Appraisal

It would be possible to make an appraisal of the forest resources of Canada by more than one method. For instance, one could use a standard forest classification as a basis for estimating the productive capacity of each forest region. This would require reliable inventory information on the area and volume of the commercially productive forests, as well as growth and yield data for each forest section. The results obtained would be relatively independent of existing provincial inventories, but should give a reasonable figure for regional productivity. The application of this method in the comparison of productivity with depletion, however, would necessitate the compilation of utilization statistics by forest section or region rather than by provinces, as it is now done by the Dominion Bureau of Statistics. Consequently, a method of appraisal had to be selected for this study which would permit the use of statistics on forest depletion by provinces. Our appraisal,

therefore, accepts estimates of forest area, volume and allowable cut from each forest authority, and relates them by groups of provinces to the estimated market demand as summarized in the previous chapter.

Forest inventory procedures in the different provinces are generally comparable, although details of sampling methods vary from province to province and even by districts within one province. Under the terms of the Canada Forestry Act, seven provinces now receive financial assistance from the federal government for their inventory programmes. All forest authorities use aerial photographs in the preparation of cover-type maps and apply ground sampling for estimating timber volumes by species. Stratified sampling methods are in general use, grouping stands of the same height, subtype, and canopy-density class. The more intensive survey methods are restricted to those areas which are commercially productive and which are expected to be in use in the near future. Extensive areas of small private holdings, such as farm woodlots, are surveyed by means of a modified area-sampling procedure or by the use of photo mosaics in place of forest-type maps. Reconnaissance or other comparable sampling methods are employed on the potentially accessible forests, with the result that inventory estimates for these forests are less reliable than those for the contiguous areas.

The history of forest inventories in Canada indicates that most, if not all, provincial authorities have provided in the past what later proved to be low estimates of their forest resources. This situation is discussed more fully later in relation to allowable cut. Forest inventory programmes are at various stages of completion in different provinces. In fact, the forest inventory of any province is never actually finished, but is continually in need of revision as new resource information becomes available or as depletion of one kind or another occurs. Table 63 shows the progress toward the achievement of the present objectives as reported by each province in March, 1956.

Timber Resources

Estimates of area and volume for the commercially productive forests have been obtained by this Commission from all available sources. For the purpose of this study, these estimates have been placed in groups corresponding to four regions—the Atlantic, Central, Prairies and North, and British Columbia. Tables 64 and 65 give an area classification for the accessible and potentially accessible forests, subdivided according to Crown (occupied and vacant) and private lands.

Individual provinces' interpretations of accessibility vary considerably, with the result that measures of productive capacity based on the accessible forest area in a province are not the most accurate means of comparing the real potentials. Some provinces class as accessible only those forests which are expected to come into use in the near future, whereas others consider

most of the forest area to be accessible. The total area of commercially productive forests, therefore, is considered to be a more realistic basis for measuring production potential from province to province than the accessible area alone.

Tables 66 and 67 give the merchantable volume (usable portion of all trees four inches and more in diameter at breast height) of softwoods and hardwoods for the accessible and potentially accessible forests. This information is summarized in graphical form by groups of provinces in Figure 26.

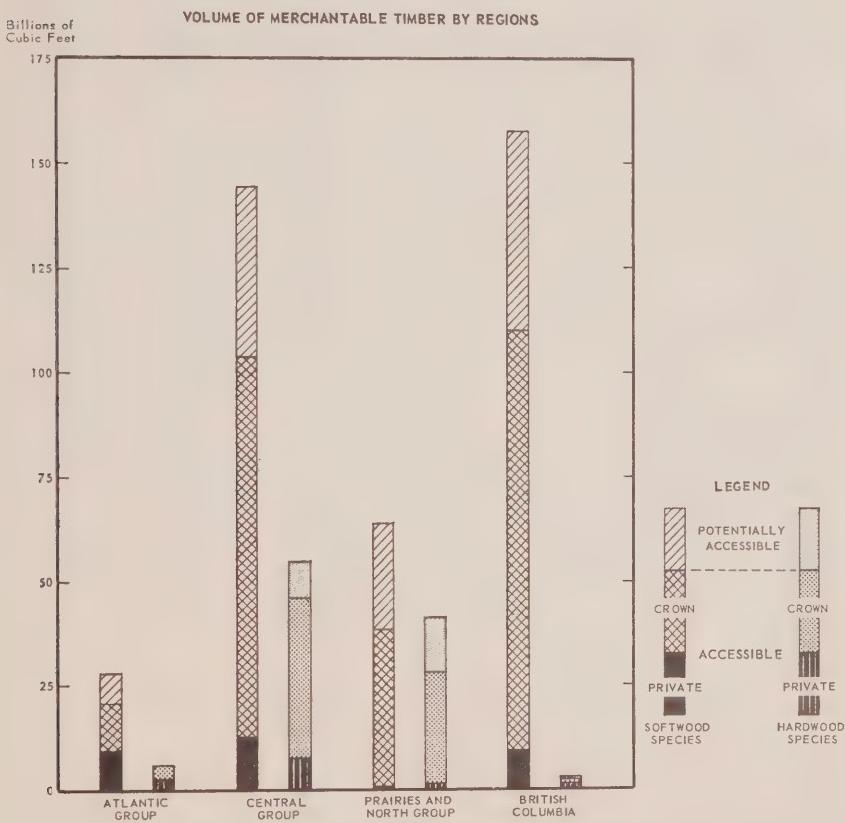


Figure 26

Softwood species comprise about four-fifths of the total volume in the commercially productive forests of Canada. British Columbia accounts for about 40% of the softwoods; the central group, for 37%; the Prairies and North group, for 16%; and the Atlantic group for the remaining 7%. The central group, on the other hand, has the largest proportion of the hardwood

species with 53% of the Canadian hardwood total, followed by the Prairies and North group with 39%, and the Atlantic group and British Columbia with 6% and 2% respectively.

Table 63

PROGRESS IN FOREST INVENTORIES^a
(area in millions of acres)

Province or territory	Commercially productive forest area	Status of inventory programme	
		Area	Percentage
Newfoundland.....	19.5	8.6	44
Prince Edward Island.....	0.3	0.3	100
Nova Scotia.....	10.0	6.5	65
New Brunswick.....	14.5	10.4	72
Atlantic group.....	44.3	25.8	58
Quebec.....	139.0	90.4	65
Ontario.....	108.0	80.1	74
Central group.....	247.0	170.5	69
Manitoba.....	34.3	32.0	93
Saskatchewan.....	25.8	19.2	74
Alberta.....	68.4	65.5	96
Yukon Territory.....	27.0	11.5	43
Northwest Territories.....	21.5	6.2	29
Prairies and North group.....	177.0	134.4	76
British Columbia, coast.....	15.1	10.2	68
British Columbia, interior.....	63.7	28.6	45
British Columbia (total).....	78.8	38.8	49
Canada (grand total)			
Millions of acres.....	547.1	369.5	68
Thousands of square miles.....	854.8	577.3	68

^a Based on reports received from the provinces, indicating areas covered by inventories under their own programmes.

Table 64

LAND CLASSIFICATION, 1956

(area in millions of acres)

Province or territory	Forested land		Non- forested land	Total land	Water	Gross area
	Commercially productive	Non-productive (non-commercial)				
Newfoundland.....	19.5	34.1	53.6	32.2	85.8	12.0
Prince Edward Island	0.3	0.1	0.4	1.0	—	1.4
Nova Scotia.....	10.0	0.3	10.3	2.4	12.7	0.8
New Brunswick	14.5	0.3	14.8	2.8	17.6	0.3
Atlantic group.....	44.3	34.8	79.1	38.4	117.5	13.1
Quebec.....	139.0	9.4	148.4	186.9	335.3	45.5
Ontario.....	108.0	31.3	139.3	80.9	220.2	43.8
Central group.....	247.0	40.7	287.7	267.8	555.5	89.3
Manitoba	34.3	41.9	76.2	64.3	140.5	17.1
Saskatchewan.....	25.8	51.2	77.0	63.9	140.9	20.2
Alberta	68.4	43.6 ^a	112.0	47.2 ^b	159.2	4.2
Yukon Territory	27.0	25.0	52.0	79.4	131.4	1.1
Northwest Territories	21.5	103.0	124.5	67.7	80.2	32.9
Prairies and North group	177.0	264.7	441.7	932.5	1,374.2	75.5
British Columbia, coast.....	15.1	—	—	—	—	—
British Columbia, interior	63.7	—	—	—	—	—
British Columbia (total)	78.8	79.5	158.3	71.7	230.0	4.4
Canada (grand total)	547.1	419.7	966.8	1,310.4	2,277.2	182.3
Millions of acres	854.8	655.8	1,510.6	2,047.5	3,558.1	284.8
Thousands of square miles						

a Includes 3,456,000 acres of non-productive (non-commercial) forest land in Wood Buffalo Park.
b Includes 2,816,000 acres of non-forested land in Wood Buffalo Park.

Table 65

COMMERCIALLY PRODUCTIVE FOREST LAND, 1956
(area in millions of acres)

Province or territory	Accessible			Potentially accessible			Total
	Crown		Private	Crown		Private	
	Occupied	Vacant	Total	Occupied	Vacant	Total	
Newfoundland	4.4	2.5	8.1	5.2	6.2	—	11.4
Prince Edward Island	—	0.3	0.3	—	—	—	0.3
Nova Scotia	0.5	2.5	7.0	10.0	—	—	10.0
New Brunswick	—	7.5	7.0	14.5	—	—	14.5
Atlantic group	12.4	5.0	15.5	32.9	5.2	6.2	44.3
Quebec	47.6	27.5	15.3	90.4	—	48.6	139.0
Ontario	48.2	24.0	10.4 ^a	82.6	—	25.4	108.0
Central group	95.8	51.5	25.7	173.0	—	74.0	247.0
Manitoba	1.5	17.0	2.1	20.6	—	13.7	34.3
Saskatchewan	0.9	11.8	3.8	16.5	—	9.3	25.8
Alberta	2.8	34.7 ^b	9.1	37.5	—	30.9	68.4
Yukon Territory	—	d	7.5	—	9.1	17.9	27.0
Northwest Territories	—	d	—	—	7.5	14.0	21.5
Prairies and North group	5.2	80.1	5.9	91.2	—	85.8	177.0
British Columbia, coast	1.6	7.8	1.2	10.6	0.7	3.3	4.5
British Columbia, interior	1.4	40.6	2.6	44.6	0.6	17.4	1.1
British Columbia (total)	3.0	48.4	3.8	55.2	1.3	20.7	1.6
Canada (grand total)	—	—	—	—	—	—	—
Millions of acres	116.4	185.0	50.9	352.3	6.5	186.7	1.6
Thousands of square miles	181.9	289.1	79.5	550.5	10.1	291.7	2.5

^a Private lands include a provisional estimate of 2,631,000 acres of farm woodlots and other private lands in Ontario.

^b Includes 185,000 acres of occupied Crown land and 2,695,000 acres of vacant Crown land in Wood Buffalo Park.

^c An estimated 5,784,000 acres of private lands are excluded, as no volume estimates are available.

^d Less than 10,000 acres.

Table 66

VOLUME OF MERCHANTABLE^a SOFTWOODS AND HARDWOODS,
1956, IN ACCESSIBLE FOREST
(millions of cubic feet)

Province or territory	Softwoods			Hardwoods			Total, all species	
	Crown	Private	Total	Crown	Private	Total	Volume	Cubic feet per acre
	Volume	Volume	Volume	Volume	Volume	Volume		
Newfoundland.....	5,589	960	6,549	233	40	273	6,822	842
Prince Edward Island	—	176	176	—	75	75	251	837
Nova Scotia.....	1,632	3,808	5,440	408	952	1,360	6,800	680
New Brunswick.....	4,420	4,130	8,550	2,050	1,900	3,950	12,500	862
Atlantic group.....	11,641	9,074	20,715	2,691	2,967	5,658	26,373	802
Quebec.....	41,372	8,407	49,779	13,790	2,803	16,593	66,372	734
Ontario.....	49,883	44,58	54,341	25,375	5,115	30,490	84,831 ^b	1,027
Central group.....	91,255	12,865	104,120	39,165	7,918	47,083	151,203	874
Manitoba.....	4,859	131	4,990	2,150	295	2,445	7,435	361
Saskatchewan.....	5,020	426	5,446	5,080	1,584	6,664	12,110	734
Alberta.....	22,496	—	22,496	16,677	—	16,677	39,173	1,043
Yukon Territory.....	2,475	—	2,475	560	—	560	3,035	334
Northwest Territories.....	3,132	—	3,132	1,603	—	1,603	4,735	632
Prairies and North group.....	37,982	557	38,539	26,070	1,879	27,949	66,488	728
British Columbia, coast.....	38,595	7,242	45,837	326	23	349	46,186	4,357
British Columbia, interior.....	62,819	1,347	64,166	1,256	22	1,278	65,444	1,468
British Columbia (total).....	101,414	8,589	110,003	1,582	45	1,627	111,630	2,022
Canada (grand total).....	242,292	31,085	273,377	69,508	12,809	82,317	355,694	1,010

^a Merchantable—The volume of trees four inches and more in diameter at breast height, exclusive of the volume in the tops and stumps.

^b Includes a provisional estimate of 2,418 million cubic feet on farm woodlots and other private lands in Southern Ontario.

Table 67

VOLUME OF MERCHANTABLE SOFTWOODS AND HARDWOODS,
1956, IN POTENTIALLY ACCESSIBLE FOREST
(millions of cubic feet)

Province or territory	Softwoods			Hardwoods			Total, all species	
	Crown	Volume Private	Total	Crown	Volume Private	Total	Volume	Cubic feet per acre
Newfoundland.....	7,153	—	7,153	—	—	—	7,225	633
Prince Edward Island.....	—	—	—	—	—	—	—	—
Nova Scotia.....	—	—	—	—	—	—	—	—
New Brunswick.....	—	—	—	—	—	—	—	—
Atlantic group.....	7,153	—	7,153	72	—	72	7,225	633
Quebec.....	19,586	—	19,586	2,430	—	2,430	22,016	453
Ontario.....	22,414	—	22,414	5,603	—	5,603	28,017	1,103
Central group.....	42,000	—	42,000	8,033	—	8,033	50,033	676
Manitoba.....	1,901	—	1,901	205	—	205	2,106	154
Saskatchewan.....	3,500	—	3,500	1,717	—	1,717	5,217	561
Alberta.....	8,549	—	8,549	8,129	—	8,129	16,678	540
Yukon Territory.....	4,750	—	4,750	1,110	—	1,110	5,860	327
Northwest Territories.....	6,337	—	6,537	1,826	—	1,826	8,363	597
Prairies and North group.....	25,237	—	25,237	12,987	—	12,987	38,224	445
British Columbia, coast.....	17,334	2,310	19,644	132	18	150	19,794	4,398
British Columbia, interior.....	26,173	1,612	27,785	516	32	548	28,333	1,484
British Columbia (total).....	43,507	3,922	47,429	648	50	698	48,127	2,040
Canada (total).....	117,897	3,922	121,819	21,740	50	21,790	143,609	737
Accessible volume.....	242,292	31,085	273,377	69,508	12,809	82,317	355,694	1,010
Canada (grand total).....	360,189	35,007	395,196	91,248	12,859	104,107	499,303	913

Allowable Cut

The calculation of the allowable cut of a forest area requires an estimate of the volume of mature timber, an estimate of economic maturity for one or more of the main species, and growth data for the immature stands. The resulting estimate may also be referred to as the sustainable cut, or even as net depletion. To arrive at this figure, many methods are employed, in accordance with the particular forest conditions under study. The provincial forest authorities may use volumetric formulae or area allotment methods, or they may even apply a straight percentage to the volume of primary growing stock to obtain their allowable cut estimate. The precision of the estimate varies considerably from province to province, and even among the accessible and potentially accessible forests within a province. Relatively intensive methods are employed on such forests as those of the coast region of British Columbia or the more accessible Crown lands of Ontario, whereas for less accessible areas or for many private lands, the allowable cut estimate is little better than an informed guess.

Allowable cut estimates should be considered only as broad generalizations covering many different sets of forest conditions. However, as they are based on low inventory estimates and checked only with present and past operating conditions, they represent what can be considered a minimum prediction of what depletion the forest can sustain in the future. Moreover, allowable cuts are usually applicable for not more than five to ten years, and therefore would not normally be used as bench-marks for 1980 wood requirements. The effect of extending to 1980 the short-term prediction used in this study may well be an estimate of future yield that is lower than can reasonably be expected.

Estimates of allowable cut, as provided to the Commission, are presented in Tables 68 and 69. They have been totalled by regions for purposes of this study, so as to provide a basis for comparison with utilization figures in 1954 and estimated requirements for 1980. It will be seen that for the accessible productive forests the allowable cut ranges from an average of seven cubic feet per acre for the Yukon to 61 cubic feet per acre for the coast region of British Columbia. For Canada as a whole, the average for the same forests is 18 cubic feet per acre, and for the potentially accessible forests it is 11 cubic feet per acre. In a later chapter, methods of increasing the allowable cut by means of better forest management and utilization practices are examined.

Table 68

ALLOWABLE CUT ON ACCESSIBLE FOREST

(millions of cubic feet)

Province or territory	Softwoods		Hardwoods		Total, all species	
	Merchantable volume, 1956	Allowable cut	Merchantable volume, 1956	Allowable cut	Merchantable volume, 1956	Allowable cut per acre
Newfoundland.....	6,549	123	273	8	6,822	131
Prince Edward Island.....	176	8	75	3	251	11
Nova Scotia.....	5,440	136	1,360	34	6,800	170
New Brunswick.....	8,550	300	3,950	150	12,500	450
Atlantic group.....	20,715	567	5,658	195	26,373	762
Quebec.....	49,779	995	16,593	332	66,372	1,327
Ontario.....	54,341	783	30,490	671	84,831	1,454
Central group.....	104,120	1,778	47,083	1,003	151,203	2,781
Manitoba.....	4,990	100	2,445	73	7,435	173
Saskatchewan.....	5,446	134	6,664	169	12,110	303
Alberta.....	22,496	450	16,677	411	39,173	861
Yukon Territory.....	2,475	50	560	11	3,035	61
Northwest Territories.....	3,132	63	1,603	32	4,735	95
Prairies and North group.....	38,539	797	27,949	696	66,488	1,493
British Columbia, coast.....	45,837	641	349	9	46,186	650
British Columbia, interior.....	64,166	706	1,278	32	65,444	738
British Columbia (total).....	110,003	1,347	1,627	41	111,630	1,388
Canada (grand total).....	273,377	4,489	82,317	1,935	355,694	6,424

Table 69

ALLOWABLE CUT ON POTENTIALLY ACCESSIBLE FOREST
(millions of cubic feet)

Province or territory	Softwoods			Hardwoods			Total, all species		
	Merchantable volume, 1956	Allowable cut	Merchantable volume, 1956	Allowable cut	Merchantable volume, 1956	Total	Cubic feet per acre		
Newfoundland	7,153	143	72	2	7,225	145	13		
Prince Edward Island	—	—	—	—	—	—	—		
Nova Scotia	—	—	—	—	—	—	—		
New Brunswick	—	—	—	—	—	—	—		
Atlantic group	7,153	143	72	2	7,225	145	13		
Quebec	19,586	392	2,430	49	22,016	441	9		
Ontario	22,414	314	5,603	78	28,017	392	15		
Central group	42,000	706	8,033	127	50,033	833	11		
Manitoba	1,901	38	205	6	2,106	44	3		
Saskatchewan	3,500	52	1,717	26	5,217	78	8		
Alberta	8,549	171	8,129	203	16,678	374	12		
Yukon Territory	4,750	95	1,110	22	5,860	117	7		
Northwest Territories	6,537	131	1,826	36	8,363	167	12		
Prairies and North group	25,237	487	12,987	293	38,224	780	9		
British Columbia, coast	19,644	275	150	4	19,794	279	62		
British Columbia, interior	27,785	147	548	13	28,333	160	8		
British Columbia (total)	47,429	422	698	17	48,127	439	19		
Canada (total)	121,819	1,758	21,790	439	143,609	2,197	11		
Accessible allowable cut	273,377	4,489	82,317	1,935	355,694	6,424	18		
Canada (grand total)	395,196	6,247	104,107	2,374	499,303	8,621	16		

Table 70

ROUNDWOOD PRODUCTION: 1954 vs. 1980, ESTIMATED^a
(millions of cubic feet)

	Logs		Pulpwood		Other products		Total		Percentage	
	1954	1980	1954	1980	1954	1980	1954	1980	1954	1980
Atlantic group.....	114	150	209	300	63	50	386	500	13	10
Central group.....	403	665	877	1,460	214	125	1,494	2,250	48	46
Prairies and North group.....	108	225	33	215	83	60	224	500	7	10
British Columbia group.....	842	1,325	145	300	15	25	1,002	1,650	32	34
All groups.....	1,373	2,115	1,193	2,075	176	130	2,742	4,320		
Softwoods.....	94	250	71	200	199	130	364	580		
Hardwoods.....										
Canada (total).....	1,467	2,365	1,264	2,275	375	260	3,106	4,900	100	100
Percentage.....	47	48	41	47	12	5	100	100		

^a See text, page 178.

Roundwood Production

Statistics on primary forest production as now collected and published by the Dominion Bureau of Statistics do not present a complete picture of the output of forest products in Canada. As has already been mentioned, the Commission has made an analysis of timber cut in Canada, using all available data collected by provincial authorities and the Dominion Bureau of Statistics, and has arrived at an estimate for the year 1954, given in Table 70. For convenience in analysing data, total production figures have been subdivided into three classes: logs (for lumber, other sawn products and veneer); pulpwood (including exports); and all other products. These estimates should be considered tentative only, as the D.B.S. Forestry Section is now in the process of revising the estimates of roundwood production for its publication, *Operations in the Woods*.

The central region now accounts for 48% of total production and 69% of the pulpwood produced. Canadian log production makes up 47% of total roundwood output, and pulpwood 41%. Log production in British Columbia makes up 84% of that province's total roundwood production and 57% of the Canadian output of logs. These percentages will be referred to later in describing the regional shift in production predicted for 1980.

Roundwood statistics are not presented separately for Crown and private lands, as in some provinces figures for private lands are either rough estimates or are based on decennial census returns. Nova Scotia is an example of the cutting on private lands. These lands comprise 70% of the commercially productive forests and account for 96% of the primary forest production. In Quebec, private lands comprise 17% of the accessible commercially productive forests and supply 49% of the primary production. In British Columbia, only 7% of the commercially accessible forest is under private ownership, whereas provincial reports indicate that 34% of the production is from private lands.

Regional Supply Considerations

The problem of whether the estimated wood requirements of 1980, as summarized in Chapter 7, can be supplied from the commercially productive forest area is one which must be considered with respect to regional wood supply rather than for the country as a whole. The four regions already mentioned are used to describe in a general way the forest resource situation at the present time and to suggest what expansion of the forest industries may be expected in each region by 1980. The opinions expressed are the results of discussions between members of the Commission forestry study group and government and industry forestry officials throughout Canada. In certain instances, these views disagree to some extent with the statistics on the balance between allowable cut and future requirements, as presented in

this chapter. This may be explained by the fact that the statistics concerning demand in 1980 are the outcome of estimated future world demand, whereas the regional expressions of opinion are probably qualified by the current demand situation.

(1) *Atlantic Group*—This region represents two widely divergent sets of forest conditions, that of the Maritimes and that of Newfoundland, and consequently it will be described in two sections. The Maritime Provinces have had a long history of logging, fire, and insect attack. The stands of timber have thus been left generally in an understocked condition. The spruce budworm epidemic in northern New Brunswick threatens the mature growing stock of balsam fir, and the birch dieback has all but eliminated commercial birch operations for the present in these provinces. There seems to be little doubt that the pulp and paper industry will continue to expand, and new pulp and paper mills may be expected in both New Brunswick and Nova Scotia within the next decade, in addition to the expansion of existing plants. The situation with regard to the future of the lumber industry is not so clear. The provincial forest services favour integrated operations, in which more than one industry would be assured of an adequate supply of raw material. The cautious opinion from forestry officials in general is that the present production of lumber can be maintained, and possibly increased, especially if more use is made of hardwoods. The gradual disappearance of yellow birch for lumber and veneer has meant the greatly increased use of hard maple. The farm woodlots of Prince Edward Island have supplied much of the local demand for lumber, fuelwood and fence posts for many years, and recent legislation has restricted the large-scale export of pulpwood. It is expected that the production of lumber in this province will remain approximately at its present level.

The recently published *Report of the Newfoundland Royal Commission on Forestry* recommends that the forest policy of that province should aim at the maximum possible expansion of the pulp and paper industry. It suggests the addition of another newsprint mill on the island with a pulpwood requirement of around 200,000 cords annually. Future softwood lumber production for home consumption is expected not to exceed 50 million board feet a year, and the two large companies holding pulpwood leases are encouraged to allow the cutting of white pine from their limits for local use.

(2) *Central Group*—Ontario and Quebec together contain 40% of the merchantable volume of timber in Canada. After more than

a century of lumbering, the accessible forest areas are composed largely of second-growth stands of spruce, balsam fir, pine, and tolerant hardwoods. The largest of the regions described here, this group accounts for more than 60% of the net value of production of the Canadian forest industries, and 71% of the net value of the pulp and paper industry.

The Province of Quebec has long been the centre of the pulp and paper industry. Future expansion of this industry is expected to come largely from the increased capacity of existing plants, although development of new mills is expected within the next 25 years in two large areas not yet developed—the eastern watersheds north of the Gulf of St. Lawrence and a northwestern area between Lake Mistassini and James Bay. Keen competition exists at present between sawmills and pulp and paper mills for logs. If this condition continues, the chances of maintaining lumber production at its present levels will be reduced considerably. The expected relative price increase for lumber, on the other hand, and the integration of the forest industries, such as has occurred in the coast region of British Columbia, would undoubtedly increase the usable wood supply. The diminishing supply of yellow birch for peeler logs may in time encourage the greater use of other hardwoods by the veneer and plywood industry.

The Province of Ontario is also a major producer of pulp and paper products, and continued growth is in prospect. One new pulp mill is now being planned, and expanded capacity is under development in existing plants. During recent years the province has been a net importer of lumber. The depletion of most of the old-growth pine stands will reduce opportunities for expansion of the lumber industry in this province in the next 25 years. Offsetting this to some extent is the present trend on the part of government and industry toward the management of second-growth pine stands for continuous sawtimber production, although the real significance of this development on the lumber industry may not be felt until after 1980. Increased demand for lumber for the export market may, however, result in an appreciable diversion of wood supplies to that market—supplies which might otherwise have been used as pulpwood or left unused. The supply situation in this province can also be materially improved by a continuation of the present trend toward diversification of output on the part of individual producing units and the integration of the various forest industries. This will result in the more complete utilization of the timber supply and in an increased output of all forest products from the managed forest.

- (3) *Prairies and North*—The inclusion of the Yukon and Northwest Territories with the three Prairie Provinces makes this one of the most extensive regions in Canada, containing more than one-quarter of the accessible productive forest area. Its relative remoteness from the North American markets has retarded the development of its forest industries, although lumbering for local and export markets has been carried on in northern Manitoba, Saskatchewan and Alberta since the turn of the century. White spruce reaches its optimum growth in northern Alberta, and has been the main sawtimber species in the Prairie Provinces for many years. The extensive stands of black spruce, jack pine and lodgepole pine are considered to contain sufficient supplies of pulpwood to ensure the development of five or six pulp mills in addition to the one that has been constructed in midwestern Alberta, whenever market conditions warrant such development. Recent interest in the use of white and black poplars for veneer indicates the strong possibility of a greatly increased use of hardwoods in this region. Surveys now being conducted in the Territories and in northern Alberta are leading to the prediction of considerably larger quantities of sawtimber supplies than are shown in the preliminary estimates (Table 66). A substantial increase in lumber production is expected for this part of the region in the near future because of recent leases of sawtimber limits.
- (4) *British Columbia*—The forests of British Columbia contain approximately 14% of the productive area and 32% of the merchantable timber volume in Canada. The coast region, with less than 3% of the total productive area, accounts for more than one-third of Canadian lumber production. The interior region, because of its geographic location and generally smaller timber, has developed more slowly than the coast, although, since the war, lumber production there has increased fourfold until it now makes up almost one-quarter of Canadian production.
- 'The coast region supports the fastest-growing softwood forests in Canada, and it is predicted that most of its 15 million acres of productive forests will be on a permanently managed, sustained-yield basis within 25 years. Thus, production levels in 1980 should compare closely with the productive capacity of the forests, although old-growth stands of Douglas fir will still be logged at that time.'

An almost phenomenal development in integration of the forest industries has occurred in this region, resulting in the expansion

of the pulp and paper and the veneer and plywood industries and the almost complete utilization of residual material. This trend will continue to play an important part in the future by making the production of lumber from marginal areas profitable, especially with the predicted relative price increase for that commodity by 1980.

Considerable expansion of plywood and pulpwood production is expected, and it is generally agreed that lumber will form a smaller percentage of production than at present. Lumber production for this region should remain at least at present levels for the next 25 years, assisted in part, in all probability, by the drawing of supplies of Douglas fir sawlogs from the interior region.

The interior region contains one of the largest areas of untapped forest resources in Canada. As the demand for its wood supplies increases and as more nearly accurate inventory data become available, the economic possibilities of this large forest area will become clearer. In addition to the greatly increased lumber production already mentioned, a pulp mill in the southern part of the region and a chipboard mill for the Prince George area are expected in the near future. A prediction by industry leaders of double the present volume of forest production for this region by 1980 may not be unreasonable. With increased utilization, this would not necessarily require a doubling of wood supply. It may even be too low in the light of the expected integration of forest industries with the closer utilization that would result.

Regional Supply and Production in 1980

The total wood requirements in 1980 as predicted in the foregoing market studies have been summarized in Chapter 7. Before arriving at any decision as to the adequacy of supply to meet these requirements, it is necessary to make a reasonable allocation of them by regions, and also to indicate the probable relative utilization of softwoods and hardwoods for Canada as a whole. The direction of future regional expansion trends and the increase in hardwood use will, however, be determined not only by wood supplies but also by the regional or geographic location and type of end-product demand. The answer to the question as to what quantity of each product—sawlogs, veneer logs, or pulpwood—will make up production in each region is purely conjectural, depending, as it does, on the relative regional price levels of the different products and, above all, on the forest policy of the provincial government then administering the resource. A provincial policy that en-

courages the free exchange of sawlogs, veneer logs and pulpwood among operators, for instance, will go a long way toward ensuring an adequate supply of timber for all forest industries in the province.

The total roundwood requirements for 1980 have been broken down into the three main categories already mentioned, in order to facilitate comparison with 1954 utilization figures. One possible regional allocation of these future requirements has been included in Table 70. Although it represents a fairly arbitrary prediction of the future use of softwoods and hardwoods, it is based on the best judgment of industry and government forestry officials across the country and on a product-by-product appraisal.

On the basis of this regional allocation pattern, an over-all increase of 29% in total production is predicted for the Atlantic Provinces. Of this, logs for lumber and veneer may show an increase of about 30% over present utilization; pulpwood an increase of 44%. Because of an expected continued decline in the consumption of fuelwood, which makes up most of the volume in the "other products" category, a slight reduction in the quantity of products in this category is forecast. Greater use will probably be made of hardwoods for both logs and pulpwood, particularly in Nova Scotia and New Brunswick, although the decline in use of fuelwood will affect the over-all increase in the use of hardwoods in this region.

Production in the central region shows an increase of 50% by 1980. To fill this demand, both pulpwood and logs show a two-thirds increase. Future conversions to oil and natural gas for energy and heating will mean a much reduced fuelwood consumption, which is indicated by a reduction in "other products" of 40%. The use of hardwoods is expected to show a relatively small increase in comparison with the increase for all species. Hardwood log production and also the production of hardwood pulpwood may show significant increases.

The Prairies and North group contains extensive reserves of undeveloped timber and, because of greatly expanding industrial development brought about by large energy resources, the region shows the largest increase, its production being doubled in the 25-year period. Log production is expected to increase by about 100%, and pulpwood to 2.5 million cords, or six and a half times the 1954 production. Here, too, fuelwood consumption will decline causing a reduction of more than 25% in "other products". The use of hardwoods is expected to show a slight over-all reduction, although the output of hardwood logs should rise because of the expanding veneer and plywood industry.

British Columbia, with the second largest regional resources of timber in Canada, and a 1980 projected output of 1,650 million cubic feet, shows a two-thirds increase over 1954. Production of logs for lumber and veneer may show an increase of close to 60%, whereas pulpwood production could

reach 3.5 million cords, thus rising to more than double 1954 production. Hardwood production may increase slightly but will not be a significant factor.

Forest Losses

The protection of the forest from fire and epidemics of insects and disease is of primary importance to the development of a sound forest economy. Many forest management practices may require 30 years or more for their full benefits to be realized, and engineering developments in a managed forest are built for long-term operations. It is pointless, therefore, to invest large capital sums in forestry unless there is a reasonable assurance that the forest will remain in a healthy condition.

1. Fire Losses

Fire protection measures have formed an integral part of forest management in Canada for many years. Provincial forest services provide protection from fire for most of their accessible forests. The federal government protects the Northwest and Yukon Territories and other forest lands under its control, and also conducts research in forest fire protection methods. Statistics on fire losses are collected by the provincial forest services, and are compiled for Canada by the Forestry Branch, Department of Northern Affairs and National Resources, for publication in the annual bulletin, *Forest Fire Losses in Canada*. During the 10-year period 1945-54, an annual average of approximately 1.4 million acres of forest land within provincial boundaries was reported burned, with a recorded loss in merchantable timber of 162 million cubic feet. If the Yukon and Northwest Territories are included in the foregoing estimate, the measured losses over the 10-year period average 183 million cubic feet annually, or almost 6% of the volume of wood utilized in 1954. These losses, however, are by no means representative of the total loss from forest fires, as they do not take into account the damage to water run-off control, to recreational value, and to wildlife, none of which can be measured in terms of dollars or in wood volume. Moreover, severe forest fires frequently damage soil quality, and repeated fires may permanently destroy the productivity of the soil, the result being a reduction in the area of commercially productive forest land.

It is expected that, with the passage of time, the national loss from forest fires will be reduced. The Associate Committee of the National Research Council on Forest Fire Protection predicts that, because of recent technological improvements in fire protection practices, many of which are already being applied, the amount of wood destroyed by fire in this country in 25 years' time may be no more than half that lost during the immediate postwar period.²

²This is based on a report presented to the Forestry Study Group by the Associate Committee of the National Research Council on Forest Fire Protection.

It is well known that in those provinces containing large areas of forest land not yet accessible, many fires occur which are not discovered or reported and which, even if discovered later, cannot be included in the annual summary of fire losses owing to the lack of data on them. At the same time, the total area under protection will be increased by the great expansion of commercial activity. In other words, the national coverage for reported losses will be increased. On the other hand, were a more concerted effort directed toward both the prevention and the suppression of forest fires by governments and industry alike, still more material would be saved for commercial exploitation.

Because of these qualifications and because the available fire loss statistics are valid only for the areas reported on (probably not more than half the forested area), it has been found necessary to prepare approximations. Quantitatively they are equivalent to less than 4% of the amount of wood forecast as being cut for commercial purposes in 1980. Broken down regionally in the proportions of the fire losses reported during the decade 1945 to 1954, they are given in Table 71.

Table 71

**ESTIMATED FOREST FIRE LOSSES, 1980
VOLUMES OF MERCHANTABLE TIMBER**
(millions of cubic feet)

Group	Estimated 1980
Atlantic.....	4
Central.....	47
Prairies and North.....	110
British Columbia.....	22
Canada (total).....	183

NOTE: It is not possible to separate this loss into softwoods and hardwoods.

2. Insects and Disease

Annual or periodic losses from insects and disease are most difficult to estimate with any degree of accuracy. They may include one or more of several factors, such as the volume of merchantable timber killed by insects or disease; an accumulating volume of decay in mature and overmature stands; mortality in immature stands, representing a loss in future volume growth; reduction in growth rate and the subsequent increase in economic rotation caused by repeated non-killing defoliation or infection; reduction in timber quality from dead tops and stem cankers; and even the destruction of roundwood products from beetles, stains or sap rots.

Problems connected with these losses are the responsibility of the Forest Biology Division of the federal Department of Agriculture, whose functions are in part "to conduct research and to carry out comprehensive surveys relating to the insects and diseases affecting trees, with the ultimate aim that

losses due to these factors may be reduced or prevented". Small scale experiments in direct and cultural control are carried out in preparation for extensive commercial control operations. These larger operations require the co-operative effort of industry and governments, one example of which is the spraying operation against the spruce budworm infestation in New Brunswick, undertaken by the federal and provincial governments and interested companies.

For many years forest biologists have been concerned with the problem of arriving at a realistic estimate of the afore-mentioned losses. Until recently, no such estimate had been compiled for Canada as a whole. At the request of the Commission, the Forest Biology Division, through its regional laboratories, has prepared a tentative estimate of average annual insect and disease losses in Canada, based in many instances on timber resources, the knowledge of cull factors for decay, and the losses that are known to have occurred in certain epidemics. The average annual loss for Canada, according to this survey, has amounted to 900 million cubic feet of wood. If it is assumed that no appreciable improvement over past experience can be expected in the future, then the allowable cut by 1980 should be reduced by this amount.

However, as more of the productive forests come into use, improved forest management and utilization practices and more efficient control methods should result in significant reductions in insect and disease losses in the next 25 years. It is not possible to estimate what proportion of past losses could have been avoided. For example, the greater use of balsam fir stands for pulpwood in the 1920's and 1930's undoubtedly would have resulted in fewer overmature fir stands remaining as feeding grounds for the spruce budworm. In like manner, had it been possible to utilize the birch stands of the Maritime Provinces to a much greater degree in the past 30 years, the losses attributable to the birch dieback would have been considerably smaller.

Taking into account the much greater commercial utilization and better control techniques, the estimates given in Table 72 represent a reasonable forecast of what epidemic losses from insects and disease may be expected annually by 1980. Total loss estimates are summarized in the same table.

Table 72
ESTIMATED LOSSES IN 1980
(millions of cubic feet)

Group	Insects and disease			Fire	Grand total
	Softwoods	Hardwoods	Total		
Atlantic.....	36	7	43	4	47
Central.....	125	45	170	47	217
Prairies and North.....	14	35	49	110	159
British Columbia.....	50	2	52	22	74
Canada (total).....	225	89	314	183	497

Although future losses from insect and disease epidemics are shown to be lower than losses in recent years, the potential threat of such epidemics to particular areas should not be overlooked. An example of such an epidemic is the spruce budworm infestation which has occurred in many parts of eastern Canada and which still threatens large areas. Such an infestation, if left unchecked, could destroy most of the timber over a large area and result in reduced wood supply to dependent industry until the forest should recover. Just such a catastrophe occurred in parts of New Brunswick 40 years ago, and much of the new forest has not yet reached a size for commercial operation. If great care is not exercised, epidemic losses could easily be greater than those shown.

Adequacy of Supply

The different factors included in the foregoing forest appraisal have now been described, and estimates have been set down for each. It has been shown that the estimates of allowable cut are probably low, as they are based on present operating conditions and do not take into account the probability of improved management and utilization practices in the next 25 years. The point is brought out also that allowable cut estimates are not usually applicable for a period of more than ten years, and that as such they should be treated with caution when used in comparison with roundwood requirements 25 years hence. This problem is examined later in relation to the role of forest management, and a suggestion is made that, by the end of the 25-year period, improved practices should result in at least a 20% increase in the allowable cut for forest lands of greatest productivity. To make provision for this increase, an adjusted allowable cut has been calculated for each region as a basis for determining the adequacy of regional wood supply.

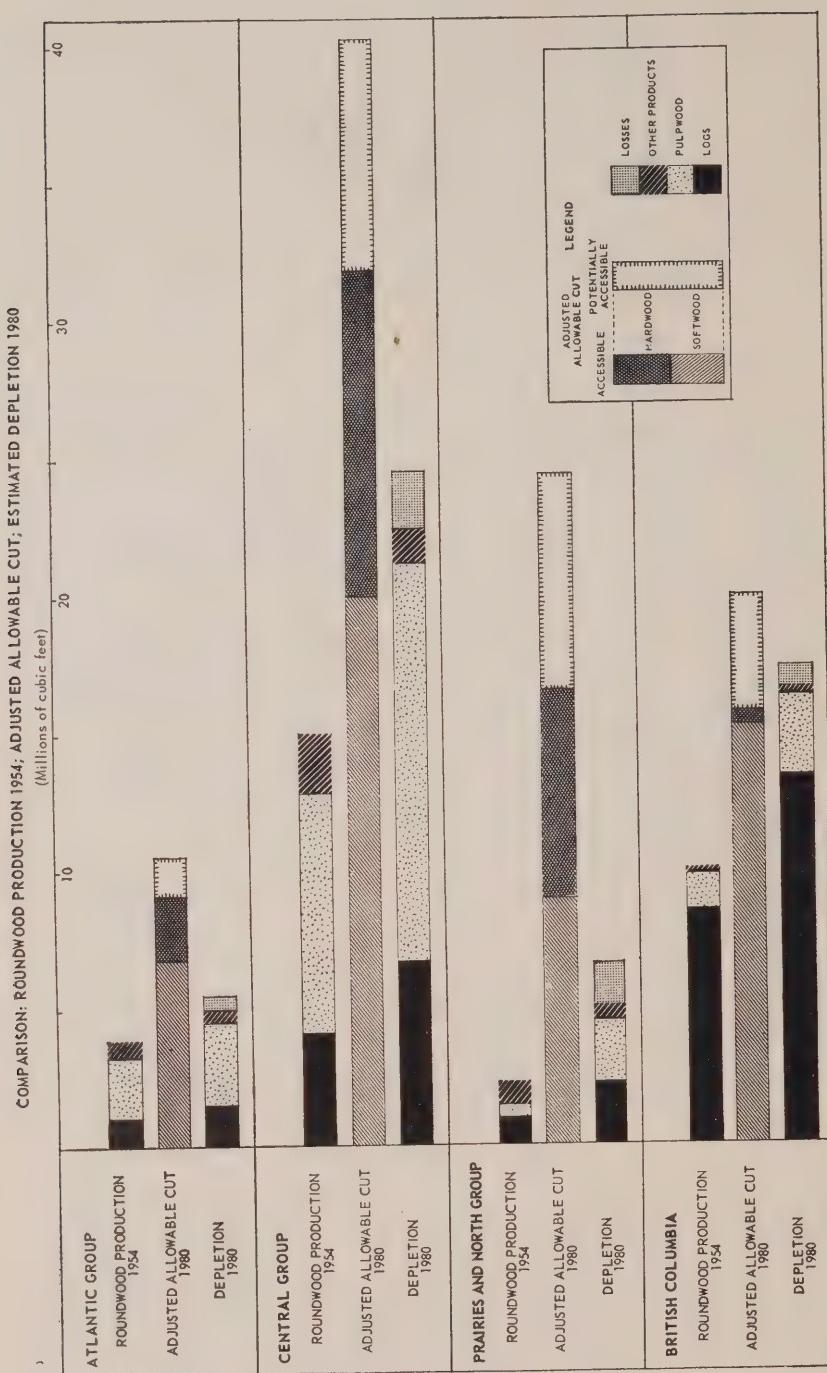
The estimated future demands, as described in the market studies, have been summarized and presented in terms of volume of merchantable timber, account being taken, in part at least, of expected improved utilization practices such as the increased use of sawmill residue for pulping. These requirements have been allocated by regions, and for Canada as a whole by softwoods and hardwoods, present utilization trends and known development plans in each province being employed as a guide.

The annual losses from fire, insects and disease that may be expected by 1980 have been appraised and added to the roundwood production given in Table 70 so that an estimate of the total annual depletion by 1980 may be obtained. These factors are summarized in Table 73, where total depletion is shown as a percentage of the adjusted allowable cut. A graphical comparison of present roundwood production, predicted allowable cut and estimated depletion in 1980 is presented in Figure 27.

Table 73

ALLOWABLE CUT vs. ESTIMATED DEPLETION, 1980
(millions of cubic feet)

	Accessible	Potentially accessible	Allowable cut		Depletion, 1980		Percentage of adjusted allowable cut
			1980	1980	Roundwood requirements	Losses	
Atlantic group							
Softwoods.....	567	143	710	820			
Hardwoods.....	195	2	197	230			
Total.....	762	145	907	1,050	500	47	547
Central group							
Softwoods.....	1,778	706	2,484	2,700			
Hardwoods.....	1,003	127	1,130	1,320			
Total.....	2,781	833	3,614	4,020	2,250	217	2,467
Prairies and North group							
Softwoods.....	797	487	1,284	1,390			
Hardwoods.....	696	293	989	1,050			
Total.....	1,493	780	2,273	2,440	500	159	659
British Columbia							
Softwoods.....	1,347	422	1,769	1,940			
Hardwoods.....	41	17	58	60			
Total.....	1,388	439	1,827	2,000	1,650	74	1,724
All groups							
Softwoods.....	4,489	1,758	6,247	6,850	4,320		
Hardwoods.....	1,935	439	2,374	2,660	580		
Canada (grand total).....	6,424	2,197	8,621	9,510	4,900	497	5,397



It has been explained already, in the consideration of timber resources, that accessible forest volume is not a realistic basis for measuring forest productivity. Thus for Canada as a whole, the total depletion of about 5.4 billion cubic feet projected for 1980 represents 74% of the adjusted allowable cut on the forests now considered accessible, and only 57% of the nation's total forest potential.

It will be noted that no attempt has been made to forecast the use of hardwoods in 1980 by regions, since their use in the future will be determined primarily by technological progress rather than by regional supply. It is estimated that hardwood production for Canada will be about one-fifth of the adjusted allowable cut for these species.

For the Atlantic region, the estimated depletion by 1980 of 547 million cubic feet of roundwood represents only 52% of the adjusted allowable cut. This apparently large surplus is accounted for by the relatively remote reserves of timber in Labrador. The same depletion is about 70% of the allowable cut for the accessible Maritimes portion of the region.

The total depletion for the central region of almost 2.5 billion cubic feet is 61% of the adjusted allowable cut for all species of this region. Hardwoods, however, make up almost 35% of this potential, thus indicating the necessity for a shift to the use of more hardwoods in Quebec and Ontario in the period under review.

For the Prairies and North region total depletion is shown as 659 million cubic feet of merchantable timber by 1980. This represents only 27% of its adjusted allowable cut of more than 2.4 billion cubic feet. This region may well experience in the next 25 years the greatest forest industrial expansion of any area of like size in Canada. The estimated depletion of more than 1.7 billion cubic feet in British Columbia is 86% of its adjusted allowable cut of 2 billion cubic feet. To meet this demand it will be necessary to open up all the commercial timber of the coast forests and a large part of the forests of the interior. For both regions, the parallel development of gas and oil resources will assist in the realization of the expansion forecast.

The foregoing analysis of the prospective supply situation has dealt only with the physical supply in relation to the estimated demand for 1980. The tentative allocation by regions has been set down in order to indicate one of the possible ways these demands could be met. In a later chapter a study is made of the effect of the changing costs of extraction and processing and the influence of these costs on our future competitive position in world markets.

LOGGING COST TRENDS, PAST, PRESENT AND FUTURE

WHILE STILL in its natural round form, wood accounts for approximately one-third of the ultimate value of all forest products sold as pulp or paper, lumber or plywood, millwork or furniture. Wood supplied to the yard of the pulp mill, to the log pond or deck of the sawmill, or for domestic consumption and the export market, as fuelwood, pitprops, poles, posts and other unmanufactured commodities, was valued in 1951 at roughly \$800 million.

Structure and Organization

The logging industry is a heterogeneous segment of the forest economy which cuts across the boundaries of several industrial groups. The pulp and paper companies provide approximately two-thirds of their wood supply by operations which they direct. The nation's sawmills obtain well over half of their sawlogs by logging standing timber owned, controlled or leased by the mill operators. The remainder is produced by a large number of independent companies and individuals making a business of cutting wood from timber limits, which they own or license, or from land upon which they have purchased standing timber. A goodly proportion of the farms of Canada have woodlots from which the farmers themselves obtain, in the off-season, wood for sale or for their own use.

Only in the British Columbia region is there an organized sawlog market in the true sense of the word. Its relative importance, however, is declining although approximately 20% of the total supply is obtained in this way.

Current estimates of logging employment range all the way up to 300,000 workers. The highest figures refer to seasonal peaks in employment. On a man-year basis, however, it is estimated that logging has provided full-time work for approximately 140,000 workers on the average since 1945.¹

¹The Dominion Bureau of Statistics' publication, *Operations in the Woods*, reports that between 126,000 and 158,000 man-years of logging labour have been employed annually since the end of World War II. However, historical data for aggregate employment are acknowledged to be unreliable. Coverage is necessarily incomplete, as information for operations on many private holdings and for the small scattered industrial operations is virtually unavailable.

The seasonal pattern varies geographically across Canada. East of the Rocky Mountains, the number of woods workers engaged during the summer period is much lower than that encountered during the late fall and early winter months.

Recent returns sent to the Dominion Bureau of Statistics showed that 650 woods operators accounted for more than half of the nation's total pulpwood production and about two-fifths of the total of sawlogs cut in Canada. The balance, which is appreciable, results from the activities of a much larger number of small logging operators, farmers and other individuals.

In the summary of income tax returns for the same year, 505 incorporated organizations and 4,230 individuals were classed as being engaged in forestry, with the indication that their primary business was the harvesting of forest products. Some of these operators might be subsidiaries of manufacturing firms or might conduct sawmill businesses. It appears that companies in this category supply approximately one-quarter of the pulpwood produced and about one-third of the sawlog supply.

Of the 623,000 farms reporting in the 1951 Census, 235,000 indicated the production of forest products in 1950. Farm woodlots provide nearly 10% of the pulpwood and sawlog supply and almost all of the fuelwood used.

Logging techniques vary greatly from region to region within the country. In British Columbia methods are quite different from those used in the rest of Canada. The rough terrain and the large-sized trees favour the extensive use of heavy mechanical equipment. For all phases of operations—felling, bucking, skidding, yarding and hauling—internal combustion power is used. The climatic conditions permit relatively continuous year-round operations, and more permanent employment and worker housing. High capitalization and continuous production are both factors which tend to demand the services of highly skilled workers and foster the payment of high wages.

By contrast, the logging operations in much of eastern Canada have, by tradition, been largely seasonal and primarily dependent on hand and horse methods. The tractor and motor truck have become much more important since the end of World War II, and in recent years power sawing has been widely adopted. In many areas the operations are becoming less seasonal, especially in pulpwood operations. In other areas, climatic conditions, the nature of topography, and the supply of seasonal agricultural or construction labour still favour winter logging and spring stream driving.

Logging has traditionally been on a one-product basis. That is, at any one time sawlogs, pulpwood or some other product has been the primary and often the sole commodity harvested. Often the operations have been limited to only one or a few of the available species. In recent years, in some

areas, there has been a trend toward the simultaneous removal of several types of material and the use of several species. This is generally referred to as integrated logging.

Logging Trade Associations

There are few organizations in the forest industries which could be considered as logging trade associations. The Canadian Pulp and Paper Association includes a woodlands section with a professional membership of more than 1,000, made up of woods engineers, woodlands operators and foresters of member companies. It also has a separate mechanization section. Included in the programme of this organization are study and research in logging techniques and in woods labour problems. Some of the basic research is done in co-operation with the Pulp and Paper Research Institute of Canada. Primary concern is, of course, with pulpwood growing and harvesting.

In British Columbia there are two organizations primarily concerned with the sawlog industry, particularly in the coastal region. The Truck Loggers Association is a group of concerns engaged primarily in supplying logs. Recently this group has been very active in presenting the views of the independent logging firms. The British Columbia Loggers Association, a larger organization including integrated forest industries, is concerned with certain aspects of logging, such as safety and statistical services.

A number of other trade associations, primarily concerned with the manufacture of forest products, are also interested, to a lesser degree, in matters pertaining to logging.

Wages and Hours in the Logging Industry

Most labour in the logging industry is paid on a piece-work basis. Available data on piece-work wage rates are not satisfactory for establishing long-term trends. However, the Department of Labour's index of average wage rates is useful in comparing the trends of wages in logging with those of other industries. In the case of logging, the index refers to daily earnings. Figure 28 shows this index for logging and the general average of all industries included in the department's survey. Logging wage rates moved with the general wage level until the end of World War I, then fell sharply during the subsequent depression. During the 1920's, the two indexes moved in parallel lines only to diverge once again during the Great Depression of the early 1930's. During World War II, average wage rates in logging again increased much more rapidly than did the general average. Since the end of the war logging wage rates have shown a trend similar to that of the economy as a whole.

LOGGING COST TRENDS, PAST, PRESENT AND FUTURE

INDEXES OF AVERAGE WAGE RATES IN CANADA 1901-55

(Base: 1949 = 100)

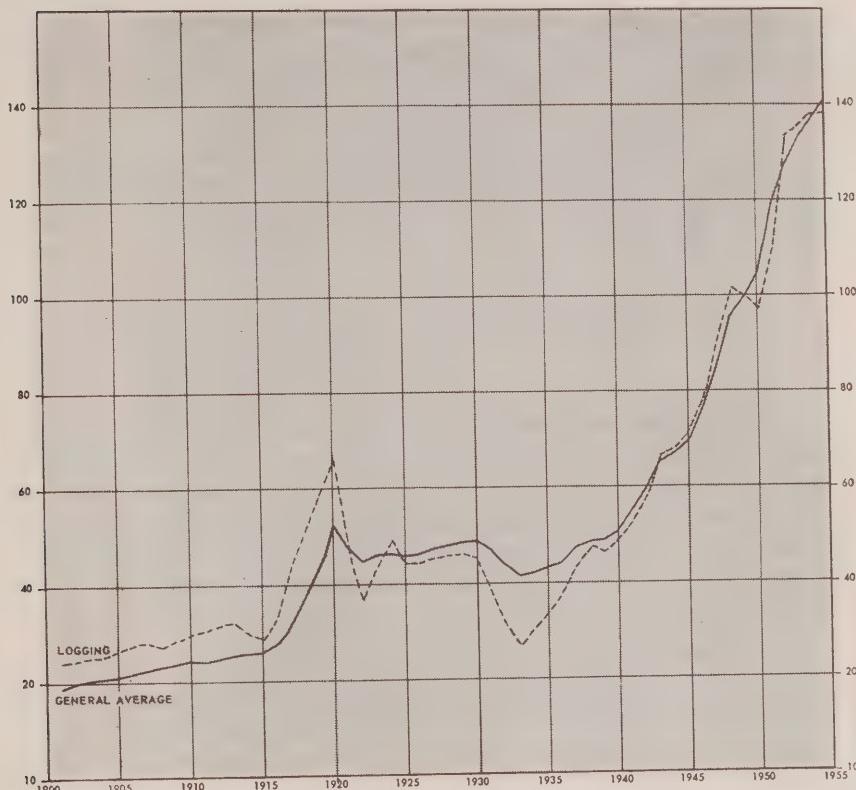


Figure 28

The strong gain made by average wage rates in logging from 1941 to 1948 reflects two factors. Not only did the average weekly earnings in logging increase more rapidly than in the economy in general, but the length of the work week decreased more rapidly. This was especially true in the case of the coast region of British Columbia, where the work week of most firms dropped from 48 to 40 hours. In eastern Canada also there has been a tendency toward a shorter work week, particularly in Ontario, but the change has not been as marked as on the Pacific coast. Assuming conditions of full employment, it appears likely that in much of eastern Canada the work week in the logging industry will continue to decrease toward that of other industries, while the average weekly earnings will tend to keep pace with the general average. This implies a further relative increase in average daily wage rates.

Productivity of Logging Labour

Production, as in other industries, results from the application of all three traditional economic agents — land (in this case forest resources), labour and capital. In the logging industry the labour element has become increasingly important. Despite the more intensive use of new types of machinery and equipment, salaries and wages have risen in relation to the total value of logs and other products cut in the woods. Amounting to approximately 35% of the gross value of production in the late 1920's, they now constitute close to 60%. On-site labour, in other words, has been receiving a much larger share of the industry's total revenue.

Very little can be said about productivity trends in the woods. As has been mentioned, man-year data are unreliable on an aggregate basis and, in addition, such data as are available are not comparable over a period of time. In the opinion of industry people, woods labour productivity probably changed very little apart from short-term variations until quite recently. The Canadian Pulp and Paper Association has collected data on pulpwood operations for the period 1940 to date. These data show an essentially stable trend until the late 1940's. For the decade 1940-50, it is estimated that labour productivity in pulpwood operations rose by perhaps 2% per annum, most of this improvement occurring at the end of the period. Since 1950, the rate of gain is estimated to be about 4% a year.

Industry sources expect that the recent improvement which has begun to occur in the productivity of woods labour will continue as training programmes and the acquisition of new equipment begin to have an effect. However, the amount of work required to produce a given quantity of wood has, in many instances, increased. The distances of timber stands from the mills and other markets have become greater. More difficult terrain has had to be overcome. Lower-quality timber in less dense stands, smaller tree sizes, trees with more limbs and of poorer form, and a greater amount of defect have required greater labour effort. An increase in the proportion of shorter logs has had a similar effect. Extra labour has been required to provide improved housing, feeding and transportation facilities for workers.

Offsetting these requirements for additional labour has been a gradual substitution of capital equipment for labour and an improvement in the quality of this equipment. Completely new systems of skidding and hauling have developed with the use of the tractor, the motor truck, steel cables, novel loading devices, improved sluices and some advances in the techniques of water transportation. More efficient cutting has resulted from the common acceptance of the power saw in recent years.

Meanwhile, changes have taken place in the composition of the labour force affecting the availability of woods workers. It has been increasingly difficult to recruit workers on a part-time basis from agriculture and con-

struction. With full, or near-to-full employment in the cities and towns, it has also been more difficult to obtain labour from the more densely populated parts of the country. Neither have immigrants been available in numbers and with experience suitable to meet the periodic labour deficiencies of the industry.

In order to attract men in sufficient numbers, wages have had to be increased. The average pay to loggers has therefore risen in relation to the general Canadian wage level since the early 1930's. It seems likely that salaries and wages will continue to be an increasing item of cost; and therefore the contribution of capital in the form of highly specialized types of cutting, handling and transportation equipment will have to be increased if the price of logs is to be stabilized in relation to that of other goods and services.

The Price of Sawlogs and Pulpwood

Because there is no clearly defined market for most roundwood products, it is difficult to indicate price movements except in the case of certain products in specific regions. However, the annual reporting to the Dominion Bureau of Statistics of a value for materials used and a value for materials exported and imported gives some data which, though they do not accurately reflect costs or prices, are useful in describing trends.²

Marked changes have occurred in the cost of pulpwood and sawlogs. The price of sawlogs and bolts as indicated by the average value of apparent production increased from a low of less than \$10 per M f.b.m. in the early 1930's to a high of more than \$40 in recent years—more than fourfold. The corresponding value for pulpwood increased from the mid '30's low of less than \$7 a cord to about \$27 a cord, nearly as much on a percentage basis as sawlogs. The general wholesale price index in the same period increased only about two-and-one-half times.

Figure 29 compares price indexes for sawlogs and bolts, pulpwood, and general wholesale prices. The roundwood prices are probably not sufficiently accurate to indicate annual changes, but some major shifts are evident. Both sawlog and pulpwood prices, which apparently lagged behind prices in general in the decline of the early period of the depression of the 1930's, eventually fell to very low levels in relation to all wholesale prices. During World War II, raw wood prices rose much more rapidly than did the wholesale price index. The fact that the average wages of loggers increased in relation to wages in the general economy is largely the cause of this shift. In the past decade, in spite of considerable fluctuations, roundwood prices have approximately kept pace with prices in general.

²Average values are obtained by dividing the value of apparent production (domestic consumption plus exports less imports) by the corresponding quantity. This average value is a price only in part. Much of the wood cut by manufacturing firms themselves is valued at accounted costs, not at market prices. The averages will also be affected by changing proportions of the various species and grades. Throughout the remainder of this section the terms "price" and "costs" will be used indiscriminately to refer to this series.

INDEXES OF AVERAGE VALUES OF ROUNDWOOD AND WHOLESALE PRICES, 1922-54
(Base: 1949 = 100)

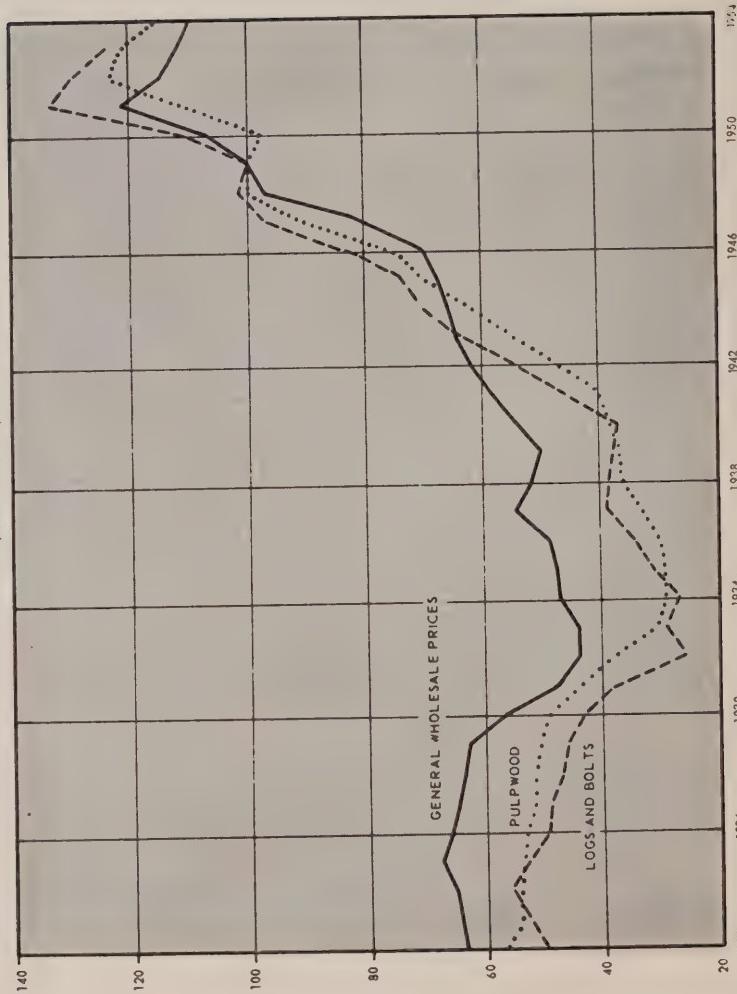


Figure 29

Price-Quantity Relationships

A study of the past relationships between quantities of a commodity produced and the prices at which it has sold (adjusted by dividing by the general wholesale price index to produce "real prices") may help to indicate whether the increased amounts of roundwood requirements previously estimated can be supplied at a cost consistent with the demand assumptions made. The fact that available data on apparent production are based largely on consumption data and the fact that a time lag is involved make the use of the information in tracing annual changes somewhat questionable. However, long-term trends or marked shifts in the relationships may be detected.

In the period from 1922 to 1929, a 50% increase in sawlog production was brought about without any real cost increase. Actually, the real price of sawlogs declined over the period. The eastern provinces showed little change in either price or quantity. In British Columbia, however, production nearly doubled while average log costs in real terms were decreasing. This implies an improving economic supply. In the same period the production of pulpwood increased by approximately 40% while real costs declined appreciably, an improvement in the supply situation being thus also indicated. In the case of pulpwood purchased by domestic mills, the quantity more than doubled. The acquisition and development of limits by pulp and paper companies in eastern Canada accounts in large part for the increase in the pulpwood supply and the nearly static nature of the sawlog situation.

The decreased demands of the depression of the 1930's were marked by decreased production, lower real prices and lower relative wages in logging. No conclusions can be drawn concerning the supply situation. With the improved demands that followed the depression, sawlog costs rose along with production. Both real prices and quantity returned to pre-depression levels in British Columbia before they did in eastern Canada. Pulpwood costs, on the other hand, did not increase in real terms until 1938, in spite of increased production. The over-expanded pulp and paper industry and a surplus of available labour permitted this apparent supply increase.

From 1940 to 1947 the price of raw wood was subject to regulation. Such increases as were allowed, were insufficient to make up for the much higher wage bill which the industry had to pay in order to attract labour. Production declined modestly, only to increase rapidly again once hostilities ceased and the supply of woods labour became more plentiful.

After the lifting of controls, real prices dropped in 1948. Since that time the trend of price-quantity relationships for sawlogs in Canada as a whole has indicated an increasing real price with increasing production. In British Columbia price changes appear to have brought about greater changes in production than is the case in eastern Canada. In the period, 1948-54, production in eastern Canada showed no upward trend while in British Colum-

bia it increased by a third. Real price changes during this period were of approximately the same magnitude in both regions. This implies that the supply situation in the east has been more inelastic than the supply situation in British Columbia for the period 1948-54.

In the case of pulpwood, on the other hand, since 1948 the increased production trend has not been accompanied by any upward trend in the real cost of pulpwood. Production of pulpwood from company limits increased by 30% from 1948 to 1954, with no change in real cost. This implies either a very elastic pulpwood supply or an improving pulpwood supply situation. The improved productivity of recent years may well account for such an economic supply increase.

Other general observations may be made. Over the period 1922-54 (omitting the control years), an increase in sawlog production has tended to be accompanied by a real cost increase in eastern Canada. In British Columbia no such relationship was clearly evident before World War II. Either supply was quite elastic or supply increases offset demand increases. However, there was a marked upward change in the level of the real cost of sawlogs between that period and the years following the lifting of price control. This was caused in large part by a marked improvement in the wages of logging labour. As has been noted, since that time the supply situation appears less elastic in both regions than it did before the war.

The situation with respect to pulpwood is quite different. In the period between the two world wars the predominant trend was increasing production and declining real costs—the appearance of increasing supply. Since 1948, real pulpwood prices have been at levels about 20% higher than those of the 1920's. Production, however, has approximately tripled between these two periods. While demand has obviously increased greatly, it is not possible to draw conclusions concerning supply changes between these two times of prosperity and high employment levels.

It is clear, however, that over the past 30 years the great increase in production—275% for pulpwood and more than 100% for sawlogs—has been accomplished only with considerable increases in the real cost of raw wood. In other words, the upward shifting of demands which have accompanied population growth and improved productivity in the economy generally have not been offset by real cost reduction in the harvesting of greater volumes of wood.

If the periods 1925-29 and 1948-54—both peacetime periods of full employment—are considered, this pattern of rising real costs with increased production is clearly evident. In the case of pulpwood, with its less exacting size and quality specifications, improved harvesting techniques have permitted a near tripling of production with only a 20% increase in real cost. As for sawlog production, supply limitations, coupled with the need to trans-

port wood over more difficult terrain, have caused real costs to rise about 40%; this, in accomplishing little more than a 50% increase in output.

Factors Affecting Future Wood Costs

In view of the past pattern of rising costs accompanying increasing production, it is important to consider the possible future movements of real costs which will be entailed in the production of wood for the estimated demands of 1980. Most of the factors contributing to the historical increase in costs have been discussed in the section on wages and hours and on the productivity of labour. Also involved is the price or cost of standing timber ready for cutting.

Many of the factors contributing to increased costs will continue into the future. More remote areas will be developed, quite possibly in northern and interior British Columbia, in the region north of the Prairies, and on the lower St. Lawrence. Offsetting this will be production from numerous areas of second growth which have developed after extensive fires and saw-log cutting toward the end of the nineteenth century, after considerable abandoning of farms in eastern Canada, and after the initial heavy pulpwood cutting, near the mills, in the 1920's.

Many of these second-growth areas are in the more accessible parts of the forested region and their return to use will, within a few decades, aid in reversing the trend toward longer hauling and stream-driving distances. Although second growth stands may not have readily available quality timber of large size, there will be a tendency toward more uniformity of material size and a smaller amount of decay. The use of formerly unused species will tend to make possible greater yields and will further offset the tendency toward more remote areas. The average size of sawtimber will continue to decline, especially in the western part of the country, where even the minimum size may still decrease appreciably.

Many of the engineering improvements made on timber limits in the past few decades will be usable in the future, and in many instances their initial capital costs may have already been accounted for. This is particularly true of many main road systems.

The number of hours worked per week will likely continue to decline, particularly in eastern Canada, where the reductions of the past decade have not matched those of the west coast. Also, since the work week is still relatively long, the reductions may be more marked than in other industries. Thus, productivity, as measured in terms of real output per man-year, will probably continue to lag behind the upward movement in wage rates necessary to recruit and maintain a highly skilled labour force.

New and better equipment, meanwhile, will play its part. Increasing use of still further improved power saws and of lighter rubber-tired skidding and hauling equipment appears obvious. It is predicted that in many quarters

whole-tree logging will soon bring about economies in the handling of wood. The use of portable barkers and chippers may also lead to cost reductions in transportation.

Research has been pursued more vigorously in the technology of pulpwood logging than in sawlog harvesting, and this may have been partly responsible for the less marked advance in pulpwood costs. However, the lack of readily available standing timber suitable for sawlog and veneer log purposes is probably a more important factor in the rising trend of log costs. Although it is reasonable to expect that relative changes in the price of sawlogs and pulpwood purchased from independent logging concerns and from farmers would have an effect in the allocation of wood to different products, average cost and consumption data for the country as a whole do not appear to reflect this.

In the case of wood from timber limits of sawmill and pulp and paper concerns, the operator's own mill requirements are, of course, ensured before wood is made available for other products. Because of the lack of integrated logging operations in the past, much material suitable for sawlogs has been used for pulpwood while sawlog operations have used for sawlogs, or left unused, material of sizes better suited for pulpwood. Although this situation may not be reflected in the cost of pulpwood, there is little doubt that the limiting of sawlog supplies in eastern Canada has caused an increase in sawlog price.

The declining use of fuelwood and, more importantly, advances in pulping technology should lead to the greater use of some of the readily available hardwoods, and this should have a levelling effect on further cost increases. A shift to more hardwood pulpwood has reached some proportions in the northeastern United States and is expected to continue. This trend may be observed in Canada, but to date the quantities used are relatively small. Although a shift to hardwood may have a retarding effect on pulpwood price increases, it must be pointed out that such a shift may have an even greater effect in the United States because of the amounts of better-quality hardwoods in that country and their greater proximity to major market centres.

These various influences, favourable and unfavourable, cannot be weighed in isolation. Instead they must be viewed against the background of expected developments in the Canadian economy at large. Forecasts reported in other studies published by this Commission indicate a two-thirds increase in real wages and a 15-20% decline in hours worked per week over the 25-year period between 1955 and 1980. The logging industry, in order to retain its labour force, will have to match (and possibly improve upon) these conditions of employment. Should it fail to meet these increased outlays with a corresponding rise in real output, further upward price adjustments must occur. Stated another way, man-hour productivity in woods operations in Canada must increase at an average annual rate of around 3%

per annum if the industry is to avoid having to raise the price of its wood in relation to that of most other commodities.

Because there is little in the record of the last 20 or 30 years to indicate that such a performance is realizable, real costs and prices are assumed to rise over the next 25 years. As increases of the order of 40% or even 50% may be necessary in order to divert material suitable for sawlogs from use in the nation's pulp and paper mills, a rise in costs of this magnitude is envisaged for wood entering into the production of lumber. The pulpwood situation differs in that there is a greater physical supply available. Yet even for pulpwood, an average annual increase in productivity of 1% to 2% may still result in a 20% to 30% increase in pulpwood prices—in relation, that is, to other goods and services.

Thus, in the manufacturing phase of Canada's forest industries, more will probably have to be paid for raw material. Whether this adverse trend in expenditures can be substantially offset by better forest management programmes and further gains in efficiency at the processing and distributing levels remains to be seen.

Table 74
WOODS OPERATIONS, CANADA, 1926-53

Year	Salaries and wages (millions of dollars)	Gross value of production (millions of dollars)	Salaries and wages as a percentage of G.V.P.
1926.....	72.0	204.4	35.2
1927.....	74.0	204.9	36.1
1928.....	80.0	213.0	37.6
1929.....	80.0	220.0	36.4
1930.....	67.0	206.9	32.4
1931.....	37.0	141.1	26.2
1932.....	43.2	92.1	46.9
1933.....	46.8	93.8	49.9
1934.....	47.0	105.5	44.5
1935.....	60.0	115.5	51.9
1936.....	54.0	134.8	40.1
1937.....	60.0	163.2	36.8
1938.....	74.0	148.3	49.9
1939.....	79.0	157.7	50.1
1940.....	100.0	194.6	51.4
1941.....	105.0	213.2	49.2
1942.....	156.0	234.4	66.6
1943.....	180.0	268.6	67.0
1944.....	195.0	301.6	64.7
1945.....	209.0	334.3	62.5
1946.....	277.0	413.3	67.0
1947.....	340.0	519.8	65.4
1948.....	347.0	586.3	59.2
1949.....	321.0	561.4	57.2
1950.....	374.0	625.7	59.8
1951.....	503.0	782.5	64.3
1952.....	488.0	815.7	59.8
1953.....	463.0	783.5	59.1

SOURCE: Dominion Bureau of Statistics.

COMPETITION, TECHNOLOGY AND THE CHANGING STRUCTURE OF CANADA'S FOREST INDUSTRIES

General

The preceding analysis of demand prospects for Canadian forest products and the corresponding appraisal of the forest supply potential have been thus far carried out more or less in isolation from the other raw materials and sectors of the economy. The forest industries estimates are integrated into the broad Canadian economic framework in Chapter 11. Additionally, although competitive and cost factors were appraised in the individual commodity forecasts, it remains now to consider some of the broader implications of the projections in the aggregate.

The forecasts in preceding chapters indicate an increase of about 58% from 1954 to 1980 in the amount of wood required from Canadian forests. This is the equivalent of an annual rate of increase of about 1.7%. Comparison of this growth rate with that projected elsewhere in the Commission's studies for the economy as a whole—3.65% per annum—suggests at first sight a relative loss of place for wood as a raw material. This, however, does not follow: historically, the Gross National Product in Canada and the United States has been rising at a long-term annual rate in the vicinity of 4% since the 1920's; raw material consumption in the two countries, meanwhile, has been moving upward at a yearly rate more in the order of 2%.

There are many reasons for this relationship between raw material requirements and over-all economic activity. Expansion of the service industries, for example, though frequently involving the use of more fuel, does not entail a proportionate increase in the use of raw materials in general. In a similar way, secondary manufacturing is largely an admixture of labour and capital applied to the resource base. Essentially, much of our economic growth beyond that associated merely with increasing population as such, is represented by the relative growth in both the manufacturing and the service sectors. There are other important factors. Improved design, for

example, has tended to be less wasteful of raw materials. And re-working of materials has become common practice: more products, once their useful life is over, are being returned as scrap to the mills, with a consequent reduction in drain on new supplies.

In short, on the assumption that economic development in the future will be of essentially the same kind as in the past—in which technology has resulted in higher degrees of processing and fabrication—it is to be expected that more products will result from a given resource input. Viewed this way, the aggregative relationship between the projected growth rates for wood requirements and for the over-all economy appears reasonable.

In the foregoing, however, the past relationship between the use of raw materials as a whole and over-all economic expansion is regarded as a test of reasonableness for the projected use of wood relative to expected over-all economic expansion. But the various materials have expanded in the past, and will undoubtedly expand in the future, at varying rates. Illustrative of the trends are data pertaining to North American utilization of energy, metals, other minerals and agricultural commodities.

Though held down by a significant decline in coal usage, North American fuel requirements have been compounding at about 2½% per annum. The consumption of metals has meanwhile been moving upward at the rate of approximately 3% a year. Minerals for structural purposes, showing a 5% average yearly increase, recorded the most rapid gains. Foodstuffs and other agriculture products meanwhile have been advancing in line with population: since 1920 their long-run growth rate has ranged between 1½% and 2% per annum.

Forest products, on the other hand, have remained on the whole, comparatively static. The amount of wood consumed in Canada and the United States differs little from what it was 30 years ago. Only during the last four or five years has there been any sign that the upward trend in over-all forest product consumption, characteristic of the years before World War II, has been resumed. These trends are illustrated in Figure 30, which shows the consumption of the major raw materials in North America from 1920 to 1955. The average annual growth rates for the main raw material groups are summarized in Table 75.

Table 75

AVERAGE ANNUAL PERCENTAGE INCREASE IN NORTH AMERICAN CONSUMPTION, 1920-55

All raw materials	Agricultural commodities	Mineral fuels	Metals	Industrial minerals	Other structural materials ^a	All forest products
2.0	1.75	2.5	3.0	5.0	4.0	1.0

^a Exclusive of wood: cement, clay products and glass.

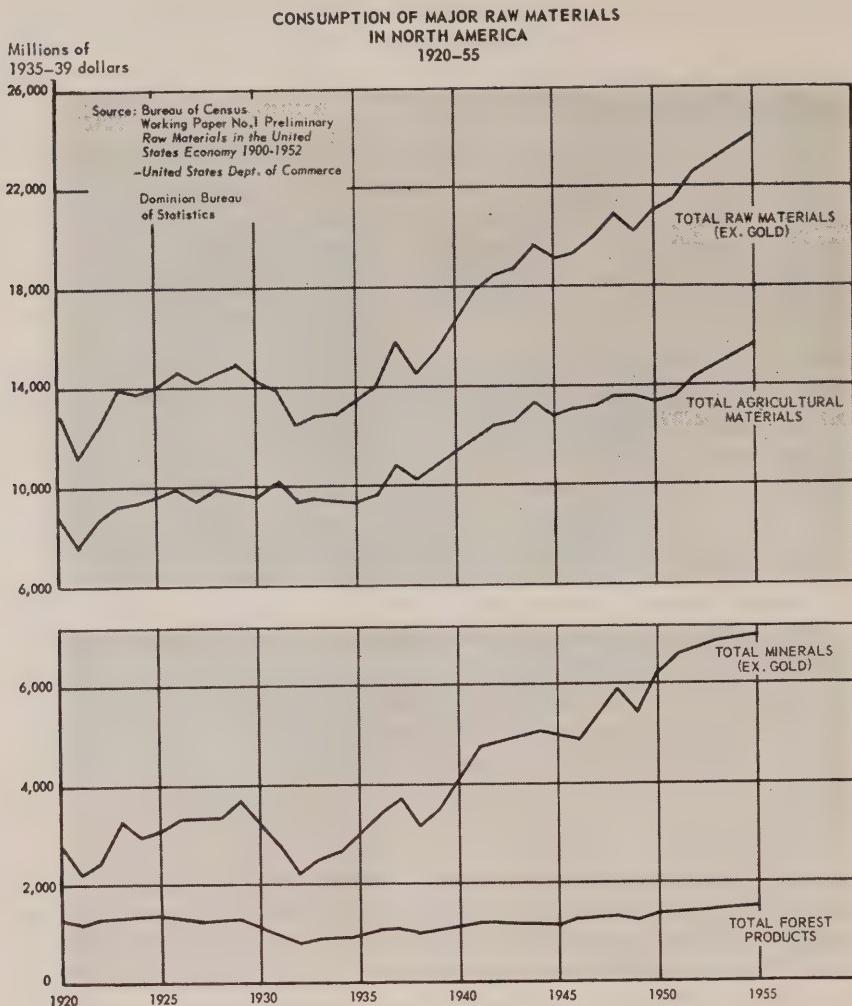


Figure 30

As just mentioned, a 58% increase has been forecast for the prospective demand on Canada's forests over the period 1954-80. For the United States, long-range projections to 1975 indicate that wood requirements will increase (in relation to the 1952 level) by 14% to 29%.¹ Roughly, these projections indicate a 20% to 30% rise in continental wood use over the next 25 years. Thus the future trend of wood use for Canada and the United States combined is seen to be markedly different from that of the period that has elapsed since World War I. Now, what are the reasons?

¹This was the range of estimates in studies published by the Weyerhaeuser Timber Company in *America's Demand for Wood, 1929-1975* (Stanford Research Institute) and by the United States Forest Service in its *Timber Resource Review*.

Table 76

CANADIAN AND UNITED STATES WOOD PRODUCTION

	Canada			United States		
	1922 Millions of cubic feet	1954 Percentage	1954 Millions of cubic feet	1920 Millions of dollars ^a	1950 Percentage	1950 Millions of dollars ^a
Lumber.....	674	35.9	1,460	47.0	476.1	515.8
Pulpwood.....	248	13.2	1,100	35.4	38.3	158.2
Fuelwood.....	708	37.8	310	10.0	647.1	55.7
Other ^b	246	13.1	235	7.6	1,161.5	429.8
Total	1,876	100.0	3,105	100.0	100.0	1,103.8

SOURCES: Canada—Dominion Bureau of Statistics reports.

United States—Paley Report, Vol. II, p. 176.

^a Constant 1935-39 dollars.^b Including pulpwood exports.

First of all, a major cause of the relatively slow rate of growth in the use of forest products has been the conflict of trends among the main end uses. This is shown in Table 76. For Canada, a major decline has occurred in the use of fuelwood. In 1922, fuelwood consumption was estimated at 708 million cubic feet, while by 1954 the figure had fallen to an estimated 310 million cubic feet. In percentages, this meant a decline from 37.7% of utilization in 1922 to 10% in 1954. Similarly, in the "other" category, influenced primarily by lower consumption of miscellaneous roundwood in Canada and lower roundwood (excluding pulpwood) exports, a slight decline has taken place in utilization. This has been more than offset by a rapid rise in domestic pulpwood utilization, which, in 1954, was more than four times its 1922 level, and by somewhat more than a doubling of wood utilization for lumber. As the table shows, between 1922 and 1954, pulpwood rose from 13.2% to 35.4% of the total wood used, while lumber rose relatively from 35.9% to 47.0%.

For the United States, precisely the same trends occur in the main end-use components: a moderate relative gain for lumber; a marked rise for pulpwood; and for the other forest products, in which fuelwood is included, a pronounced decline. Additionally, it should be noted that there is a marked difference in the aggregate changes in the two countries: Canadian total wood utilization rose by almost 66% in the 1922-54 period, while United States utilization (as measured by physical volume of production in constant dollar units) was actually 5% lower in 1950 than in 1920.

Developments as to total wood usage are, by definition, a summation of component trends as to commodity usage. Table 77 illustrates this, showing in detail the percentage breakdown of Canadian wood utilization in 1922 and 1954 and the projected pattern of requirements for 1980. The steadily decreasing importance of fuelwood and miscellaneous roundwood products will give these uses less weight in the determination of the over-all trend, just as the increasing importance of pulpwood will give this use an increasing weight.

Table 77

**PERCENTAGE BREAKDOWN OF CANADIAN WOOD
PRODUCTION, 1922 AND 1954, AND PROJECTED
REQUIREMENTS FOR 1980**

	1922	1954	1980
Domestic pulpwood.....	13.2	35.5	43.5
Logs for lumber and other sawn products.....		45.1	45.6
Logs for softwood plywood and veneer.....	35.9	1.3	2.3
Logs for hardwood plywood and veneer.....		.6	.6
Pulpwood exports.....	4.6	5.1	3.1
Fuelwood.....	37.7	10.0	3.3
Domestic miscellaneous roundwood products.....	5.0	1.6	1.1
Exports of miscellaneous roundwood products.....	3.6	.8	.5
	100.0	100.0	100.0

But apart from this mechanical reconciliation between the projected rising trend of wood usage and historical level trend (for North America), a look at factors underlying the historical component trends is useful. Reasons for the decline in the fuelwood component of wood utilization are readily apparent and need not be reviewed at length. The increased economic availability, the greater cleanliness or the increased convenience in use and transportability of substitute materials accounts for the displacement of wood as a fuel. This displacement is expected to continue.

For the other end-use commodities, an examination of relative price trends is revealing. As shown in Table 78, and illustrated in Figure 31, those pertaining to forest products have risen most.

UNITED STATES PRICE TRENDS, 1920-54
(1935-39=100)

	1920	1925	1930	1935	1940	1945	1950	1954
Forest products...	190.4	113.4	97.0	89.7	119.1	170.9	349.7	365.0
Total minerals....	219.0	135.9	106.3	94.7	97.8	126.8	212.6	234.0
Agricultural materials . . .	201.4	152.8	116.7	101.2	93.7	191.9	244.8	244.0

SOURCE: United States Bureau of Census Working Paper No. 1, 1920-50; 1954 estimated.

The prices of most agricultural materials have followed a middle course. Those relating to the fossil fuels have either remained constant in real terms or have edged slowly upward. Such price data as are available on the metals and other structural minerals in ore and concentrate form usually show declines when expressed in constant dollar terms. The latter, in other words, have become cheaper in terms of other goods and services considered collectively.

Wood arriving at the mill has become more expensive. This has already been indicated in Chapter 9. Working on through the manufacturing and distributing stages, this tendency has served both to reduce the competitive advantage of wood in a number of its former applications and also to restrict its usefulness in some of its newer and otherwise more profitable fields of application.

To some extent the rising relative price of forest products can be attributed to a scarcity of low-cost and otherwise suitable resources. A marked increase in the wages paid to woods labour has been another factor. Productivity gains have not matched rising wage costs, and this in turn is partly attributable to the nature of the resource. Wood is not a uniform material: it occurs in a variety of sizes, on widely different types of terrain and in many different species. More intensive use has rarely brought with it economies of mass handling, concentration and by-product utilization, as it has in the case of most minerals. Neither have novel means of transportation, such as the pipeline or self-loading or unloading ore carriers, been developed to make possible a substantial reduction in carrying charges.

INDEX OF RAW MATERIALS PRICES, NORTH AMERICA 1920-55

(1935-39 = 100)

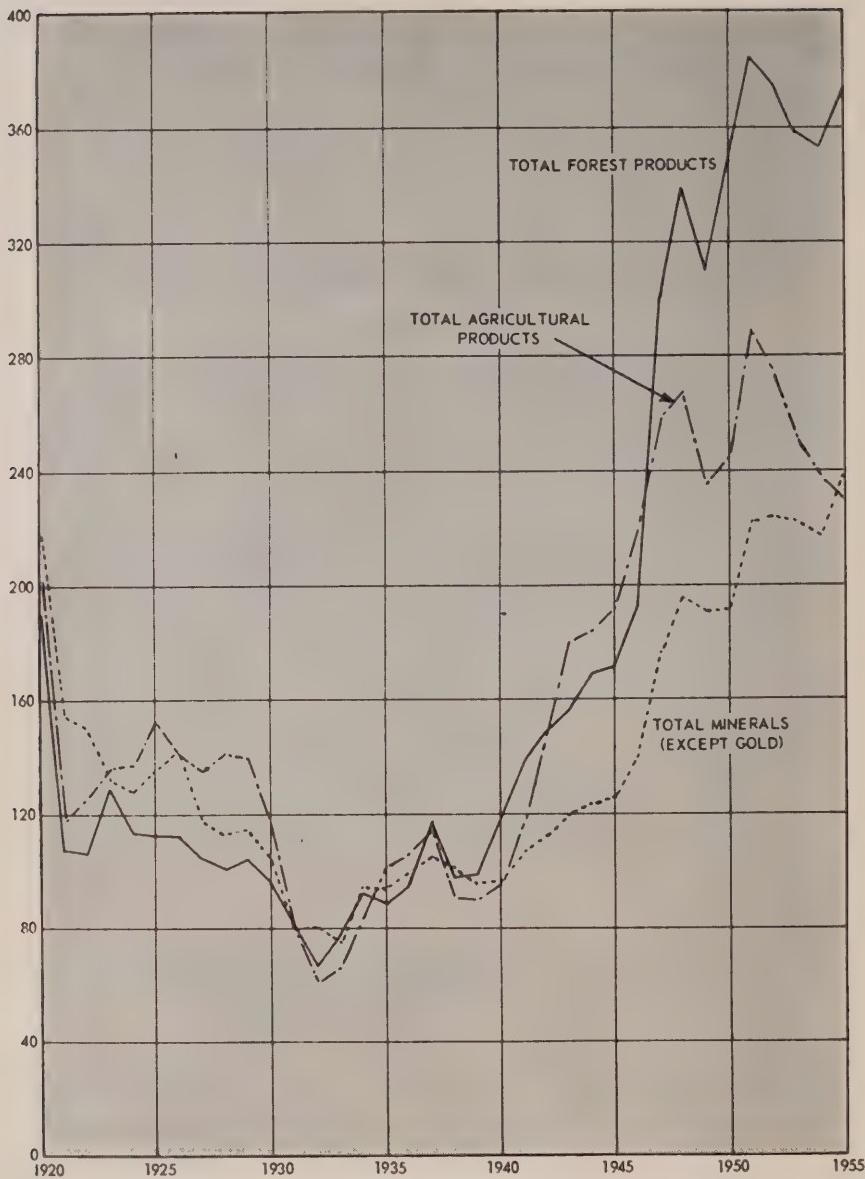


Figure 31

To carry the study a step further, real price indexes for lumber, pulp and newsprint are shown in Table 79 and in Figure 32. The actual index values are not important: these are determined simply by the choice of the base period, in this case, 1935-39. What is notable is the general configuration of each of the indexes. Thus we see that timber and lumber prices, as measured by their real price index, have risen steadily and markedly in relation to prices in general throughout the entire period. For wood pulp, although the 1920 real index value was extraordinarily high, the tendency since 1925 (as measured at 5-year intervals) has been for relative prices to remain quite stable. Much the same can be said of newsprint: in 1954 its relative price was only a shade higher than in 1925. Production of these commodities increased between 1920 and 1954 as follows: lumber, 70%; wood pulp, 393%; newsprint, 583%. In terms of wood utilization, it is here assumed that pulp-wood has expanded in use partly because of favourable relative price trends for pulp and paper, while lumber has fared less well because its relative prices have risen rapidly.

Table 79

CANADIAN REAL PRICE TRENDS, 1920-54

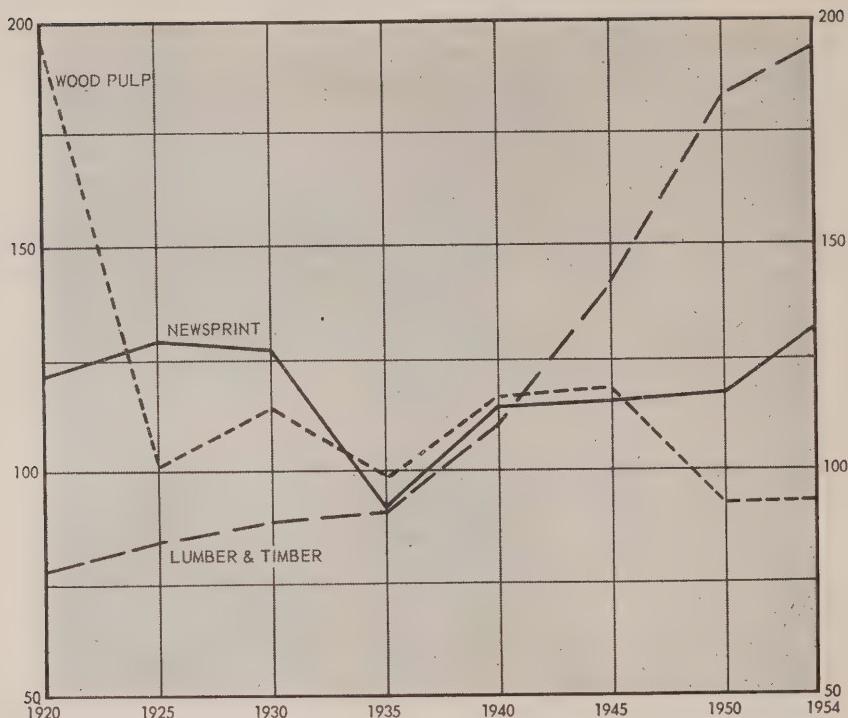
(1935-39=100)

	1920	1925	1930	1935	1940	1945	1950	1954
Timber and lumber.....	77.8	84.1	88.8	91.5	109.7	140.2	183.8	193.1
Wood pulp.....	196.0	101.3	114.7	98.9	115.7	118.6	92.4	92.8
Newsprint.....	121.8	129.4	127.6	91.8	114.3	115.8	117.8	130.8

It is readily admitted that relative price movements are not the only factors determining demand and utilization patterns. The additional factors mentioned in the case of fuelwood—such as convenience, cleanliness, uniformity, transportability, and so on—will influence the substitution of one material for another. But undoubtedly even these factors are affected by the differential costs as between materials, and in this sense relative prices are taken to be of vital importance in the determination of consumption trends.

Historical evidence on relative demand and price movements of the kind just examined indicates that gains in efficiency commensurate with those of industries competing against wood have been achieved primarily in respect to the more advanced types of processing. It will be recalled that it is essentially this assumption which runs through earlier chapters dealing with prospective demand trends. That is why the earlier projections show that, consistent with the past, pulpwood requirements will gain markedly, lumber will expand more slowly and fuelwood will continue to decline.

In the course of the analyses required for the forecasting of these demand trends, it was necessary to ask: *Will the historical cost trends continue? Will the costs of wood continue to rise in relation to those of its*

REAL PRICE INDEXES - LUMBER AND TIMBER, WOOD PULP, NEWSPRINT
SELECTED YEARS, 1920-54

"Real" price indexes are published indexes deflated by wholesale price index values for appropriate years.

Figure 32

substitute materials? If so, will future economies in transportation, processing and distribution help to offset such relative price increases? The chapter on prospective wood supply has already indicated the adequacy of resources in relation to the roundwood requirements of 1980. The problem of primary importance, however, will be to provide the required wood at a cost that will permit the Canadian forest industries to be competitive with those of other supply sources. In short, the forest industries of Canada can expand as indicated; the supply prices of their products can be such as to justify production at the levels anticipated in the demand projections. In order to reach these levels, however, the industries must obviously maintain (at least relatively) and improve their standards of efficiency and productivity. It is this aspect of future operations which is now examined. The study starts with the forestry operations phase, proceeds to the harvesting phase and the manufacturing phase and concludes with distribution and marketing.

Forestry Operations

The expression "forestry operations phase" is here used to mean the administration, development and conservation of our forest resources—in a word, the management of these resources. The function of management may be classed, in turn, under two broad aspects: the protection of present supplies against loss or damage and the provision of new supplies to replace those being used and to meet expanding needs. These are areas of responsibility shared by private owners, large and small, by licensees under various terms and conditions, and by governments.

The two functions of management just mentioned are obviously inter-related. For the purposes of this study, however, the second—that relating to the supply of expanding needs—is of greater importance. In any case, the protection function was considered earlier. In brief, protection of the forest resource from fire, insects and disease has been improving. This has come slowly for the most part, with a gradual opening up of new areas that has brought more access roads and protection coverage, and with steady advances in control techniques. The use of aircraft illustrates a modern innovation in this field. A more dramatic advance is the attack on the spruce budworm epidemic in New Brunswick and Quebec, where governments and industry are collaborating in a large-scale operation covering more than seven million acres. Success is not yet assured, but a programme of such dimensions could not have been undertaken 20 years ago.

But though progress has been made, much remains to be done in the field of forest protection. For Canada, probably the major impediment to more rapid advance has simply been the extent of our forest resources and the remoteness and inaccessibility of much of the national area. As the forest industries—and, indeed, other industries—expand, the opening up of new areas, in conjunction with continued improvements and techniques, should reduce this impediment in the years ahead.

The second function of management—the provision of new supplies of standing timber to replace those being used and to provide for expansion—covers a wide area. The instances of the possibility of increasing physical yield from the forest by making greater use of its growth potential are numerous. Fuller utilization of present production can add greatly to current harvests. Silvicultural practices can increase the growth of merchantable wood of desirable species. The area under exploitation can be extended by reaching into more remote regions. Most of the actions necessary to bring about such increases would involve immediate higher logging costs or additional forest management expenses, and it is against this test that the rate of progress will be determined. But it is generally accepted that such cost increases would be justified in the long run, and even that some would give almost immediate returns.

Some intensive practices can make increased harvests possible in the near future. Salvage of much overmature wood can reduce losses from natural mortality and the ravages of insects and disease. Better protection from fire can reduce the drain on stands of merchantable or near merchantable size as well as permit immature forests to reach usable size. As just mentioned, the recent aerial spraying operations in New Brunswick and Quebec have shown the feasibility of reducing wood losses caused by an insect enemy. Frequent intermediate cuttings can greatly reduce the losses which occur during the development of stands.

Studies carried out in North America and practices maintained in Europe have clearly demonstrated that intermediate cuttings of a more intensive nature can increase yields not only through the reduction of losses, which would be of virtually immediate benefit, but also through the improvement of the average merchantable size of the main harvest crops. The latter result is more remote, but thinnings and improvement cuttings carried out now can certainly bring appreciable results by 1980. Canadian forestry experience in the afore-mentioned practices has not yet been developed to such an extent as to permit a definite prediction of the increase in yield that may be expected, but the experiences of the older countries of Europe and of other parts of the world suggest that an increase of at least 20% on areas of greatest productivity would be a conservative estimate. It is reasonable to expect that most of the effect of this increase in yield could be realized in 25 years' time. The advantages to be gained from cutting practices designed to ensure or improve reproduction and from reforestation programmes are in the more distant future.

It is expected that, over the next 25 years, as in the past, one important trend will be a more intensive utilization of forest stands in or close to the main areas of present-day production. The economic objective will be to reduce transportation and handling costs. Wood grown in close proximity to existing mills or along tributary river systems, where log-driving expenses can be kept to a minimum, is preferable to wood which has to be brought in over much greater distances and possibly over land. In several instances, as yet mostly small-scale, better management in such areas has helped materially to reduce one of the pressures which, in recent years, has been making for a continued rise in the cost of raw wood as delivered.

Tree farming also has important commercial possibilities and will be adopted more intensively than in the past. There are, moreover, many thousands of acres of land in farm or settled areas at present not in use which could be used efficiently for the growing of trees and which could thereby make a major contribution to Canada's forest economy. This land generally has the advantage of good location. Increasing knowledge of the techniques of hybridization and the use of plant nutrients promise an acceleration of growth rates with consequent material increases in yields. But it is also true

that the application of these practices will require a considerable investment outlay, which must be set against the comparative cost of wood from naturally regenerated sources. In Canada, the resource situation is such that these latter sources will continue to provide for much the greater part of our commercial wood production for many years to come.

The ways in which and the areas from which wood supplies can economically be increased without impairment of our forest asset in terms of standing timber could be extended to great length, but there is another, perhaps more important, underlying aspect. To manage our forests in such a way as to ensure an ample and economic supply for the future will require a degree of knowledge of the forests—their volume and species content, growth and loss rates—which does not now exist. For more remote areas, detailed knowledge of this kind is unlikely to become available in the next 25 or even 50 years.

The present and prospective forestry situations in Canada might roughly be described as follows: We have old limits, relatively a small part of the total area, which are located in economically desirable and potentially highly productive areas. These limits have been largely cut over and are in second growth. Such areas justify intensive management, and in their case a knowledge of the forest characteristics and potential is essential. On the other hand, the larger part of our forest area consists characteristically of untouched limits, where the management function is now and is likely for many years to remain one of extensive control, limited to such actions as are economically possible to ensure that a second crop will start. Though in this case, too, a more detailed knowledge of the forests is desirable, there is a lesser degree of urgency.

This is seen more clearly, perhaps, if reference is again made to the two management functions that have just been set out. It is in the so-called old limits that the second function, aimed at increasing yields by intensive management, will take on primary importance. In what are at present the untouched limits the emphasis shifts more to the protective function, with extensive management aimed at preservation and continuity. It should be added, however, that the area in the untouched limits category can be expected to decrease gradually: as the needs of the forest industries expand, new areas can be expected to come under intensive management.

By defining or describing the forestry situation in this way and thus suggesting varying degrees of urgency in our need for more detailed knowledge of the forests, we do not mean to minimize the importance of gaining such knowledge. Perhaps the serious implications of our lack of detailed information would be best illustrated by a specific example. It is known that our stock of yellow birch had suffered heavily from the birch dieback, but the degree of damage is unknown. Opinions range from predictions that this

species will shortly be wiped out to predictions that healthy young stock ensures a continuing supply. Problems of this nature require detailed information ordinarily not available in the extensive types of survey covering much of our forest areas, though they must be solved in order to provide a reliable basis for management planning.

Yet, despite this and other difficult problems, there is little doubt that a growing awareness exists on the part of governments and the forest industries for the need for, and the economic benefits to be derived from, successful forest management practices. The depletion of some of the more accessible forest resources, the rise in wood costs, and the growth of the market for wood products have increased the incentive for long-range planning in forestry operations. Technological developments favouring the cutting of wood for its fibre content, thus permitting the use of species and material which were formerly by-passed, have been working in the same direction. Eventually, the utilization of a larger proportion of the available wood supply, combined with silvicultural research aimed toward increasing yields, will help spread over a larger volume of salable products such overhead costs as protection from fire, insects and disease, and the continuing development expenditures inherent in sustained-yield management programmes.

The Harvesting Phase

In the main, technological developments in respect to the harvesting of wood will be aimed at the reduction, or at least the control, of labour costs. Despite the growing use of chain saws and other mechanical equipment, wages still constitute by far the largest single item of cost in woods operations. That hourly rates will continue to rise in relation to wage rates in most types of manufacturing and in the service industries, there can be little doubt. As in mining, these adjustments will be necessary in order to maintain a sizable labour force in the outlying areas. Better accommodation and amenities akin to those available in the towns and cities will also have to be provided and for much the same reason. In order to counter the higher costs involved, a concerted attempt will be made to replace labour with capital. As in the other primary industries, mass-produced equipment manufactured elsewhere and often imported will therefore be introduced with a view to replacing the army of loggers and other woodsmen which would otherwise be required to produce the much larger volume of wood envisaged for 1980.

Twenty-five years from now practically all of the felling and bucking will be carried out mechanically. Within the last decade, manually operated power saws have come to account for some three-quarters of the annual pulpwood cut. In the future these saws will be lighter and more powerful than present-day models. They will thus be more efficient, in the sense that they will permit each woods labourer to turn out several times as much sawtimber or pulpwood as he does today.

Although the horse is still, by and large, the most effective prime mover used in woods operations in eastern Canada, it too will tend to disappear with the passage of time. Rubber-tired skidding and hauling equipment will be taking its place. Specialized machinery designed for this purpose, rather than adaptations of present-day construction equipment, will also be employed in an effort to cut down the number of man-hours in the woods.

Paralleling this will be developments along less conventional lines. Experiments aimed at whole-tree and tree-length logging will have achieved significant results by 1965 and 1970; and indeed, by 1980, with the wider adoption of equipment already at the development and trial stage, this type of logging will probably have gone far to replace power saws in the felling operation. Entire trees may subsequently be collected at points where the selection and dispersal of material best suited for individual purposes will take place. There they may be fed into machines capable of removing limbs and bark in a single operation. The less transportable material may be reduced to the form of chips, thereby raising the over-all yield from the forest and at the same time spreading over a greater volume of output operating costs and such overhead costs as fire prevention and forest management expenses.

Along with an increasing investment in logging equipment, there will be a drive toward year-round operations. Less harvesting will be carried out on a seasonal basis, and this will permit the more expensive types of equipment to be loaded to a higher percentage of their capacity throughout their useful life. Woods operators will have an incentive to become more highly specialized, and total logging costs will become more predictable. Thus, the industry is likely to become both more capital-intensive and more highly organized. Though it may employ fewer people, it will, because of greater efficiency, be able to pay increased wages and to retain in its service a larger permanent nucleus of experienced and highly skilled workers.

The Transportation Problem

Wood, especially in its raw or relatively primary forms, is a bulky material. Having a comparatively low value-to-weight ratio, it does not usually pay to transport it over great distances. Also, being a solid of irregular form, it is, by its very nature, less easily handled than the liquid fuels and the majority of ores and mineral concentrates. Means will therefore be sought continually to effect greater weight reduction in the woods, to reduce on-site handling to a minimum, and to collect and transport the resultant product to the mills in the most efficient manner.

Bark removal in the woods, by mechanical means or by chemical treatment, will become general practice. Small portable mills will be used more as a logging tool to break down, at the logging area, logs which are partially

good and partially defective so that the good material can be moved on to the larger permanent mills for conversion, while the cull, too costly to transport, is left in the woods. The collection and dispatch of sawlogs, peeler logs and pulpwood will become even better organized. Aerial cableways, of improved design, will increase the flexibility and possibly eliminate many of the hazards of trucking in mountainous country. Similar mechanical devices may also be introduced with a view to reducing hauling costs in the less rugged terrain of eastern Canada. Much of this effort would be aimed at moving wood to rivers and streams, to tidewater or to rail and highway loading points, from which it could be transported to the mills by still more efficient means of conveyance.

Movement by water is and will continue to be the cheapest of these several alternatives. River drives, the towing of booms across lakes and in coastal waters and water-borne shipment in the more conventional sense will therefore continue as the means of handling the bulk of this traffic. Rail transportation may increase in importance. Lines built primarily for opening up of new mining camps may facilitate cutting in more remote areas. Also, a greater amount of land transportation may be called for in periods of exceptional demand, or seasonally, when water conditions are unsuitable or water transport is too time-consuming for the industry's immediate purpose. Meanwhile, trucks and motor trailers will continue in use, confined, however, to comparatively short hauls where road and highway conditions are favourable or to circumstances where flexibility in operations is desired. These means of transportation will, as now, perform an ancillary function insofar as large volume transport is concerned.

Greater utilization of slash, limbs, tree-tops and other waste material will continue to present a challenge. Left to rot in the woods, they increase the fire hazard. On the other hand, because of their exceptionally low unit value and heterogeneous character, they are extremely costly to transport from one place to another. Were this material to be reduced to chips by compact trailer-borne equipment, it would be somewhat more manageable. Wood in this form, some of the experts say, could be trucked out, bagged in large plastic containers and floated to its destination, or even pumped in water slurry by pipeline directly to the mills, where it would receive further processing.

Wood in chip form is even more voluminous than in its natural state. Overland trucking, in hilly country and over poorly maintained roads, is expensive. Plastic containers might prove useful in this case, but they are costly even if they can be used over and over again. Pipelines are another possibility, but they are economic only when they are fully and continuously loaded. At present, there are other disadvantages or problems: they do not lend themselves readily to relocation; pumping costs would be high as large amounts of water would have to be moved as well; and, finally, climatic con-

ditions in most parts of Canada would hinder these operations in the winter months. Although innovations such as these may one day bring revolutionary changes in handling methods, it is unlikely that they will significantly displace conventional methods in the period here under consideration. Primary processing, in other words, will continue to be carried out in reasonable proximity to the forests, the average distance over which the rough hewn timber moves being affected more by geographical factors influencing collection and by the optimum size of permanent mills than by the development of new ways and means of getting raw wood to market.

Nuclear energy could, and eventually may, have a modifying effect. Once it is competitive with electricity produced hydraulically or through the burning of conventional fuels, it will make the siting of new mills less dependent upon the existence near by of suitable water-power or the importation by pipeline, rail or water of natural gas, oil or coal. Thus, plants may be located more with a view to minimizing wood-hauling costs. Situated at the juncture of two or more rivers, they may be better able to draw upon the forest resources of an entire watershed. Some of the nation's more remote and yet physically suitable stands may, in this way, be drawn into the orbit of commercial exploitation. Though problems inherent in bringing in equipment, chemicals and other material supplies and in shipping out finished products will still have to be faced, nuclear energy, by setting a ceiling on fuel and power costs in outlying areas, may, by 1980, have effectively increased the supply if it has not reduced the average cost of wood moving to the nation's mills.

Wood Processing

Sawmilling, pulping, paper-making and the manufacture of supplementary products, including plywood, veneer and composite board, can conveniently be treated under a single heading. As time goes by, more of these operations will be carried out systematically and one in step with the other under a single roof. Maximum use can in this way be made of all the wood which reaches the mill. What is reject material in one case may be useful in another. Efficient sorting will ensure that logs of optimum size will be fed into the machines designed specifically to process them. Thus, each section of the plant and its equipment will be more nearly continuously loaded. Wood of given qualities will be directed into the products in which its true worth is better reflected by market prices. Capital and other fixed and maintenance charges will in this way be spread over a greater volume of production. Returns expressed in total dollar value of sales per quantity of wood processed will increase. In this way process integration, by bringing together what are at present quite separate industries in most parts of Canada, will help to offset such cost increases as may be inevitable with respect to future woods operations.

Little or nothing will be wasted. It will be rare for mills to burn or discard slabs and edgings as is still common practice today. Instead, these materials will be converted, along with shavings and sawdust, into pulp and building-boards. An increasing part of these present-day rejects may be compacted into fuel briquettes or employed in the manufacture of various moulded articles. Lumber, whether it be simply sectioned from sawlogs as it is today or built up with the aid of adhesives from small material, will also be a more uniform product. Its quality will be further improved by kiln-drying at higher temperatures or by solvent- or vapour-seasoning. Greater emphasis will be placed upon grading and care in handling, the standardized article being less subject to such defects as end splits, end and surface checks, honeycombing, collapse and chemical stain, and will therefore be more acceptable for construction and other purposes. The greater uniformity of quality and form will yield economies in the later stages of distribution, assembly and industrial utilization.

Mechanical equipment and chemical process will be married in such a way as to take advantage of the latest developments in automation. Much of the woodgrinding equipment at present in use will be scrapped in favour of other simpler and generally smaller machines. Large batch digesters will be replaced by continuous dissolving units. Paper machines will be in for a further speeding up, and a much greater variety of by-products—many of them with important chemical properties—will be recovered for sale.

At such plants it is within the realm of possibility that the majority of logs entering the mill will be placed against machines capable of reducing them at high speed to smaller subdivisions than conventional chips—as, for example, thin wafers. These would then be passed through a chemical spray and thence to a cooking device, where they would be converted into a pulp in a matter of minutes. Then the chemical solvent and dissolved lignin would be removed, the pulp being left to be bleached in a manner less drastic than any required today. All of this could conceivably happen in a single length or series of lengths of pipes. High-speed continuous pulping, geared to paper-making and the manufacture of various products, may therefore be carried out in plants more akin to present-day oil refineries or chemical factories. Employing more equipment and less labour per dollar of product, they may enjoy similar economies of scale. Such plants, in order to compete, will probably be large. They must draw on an extensive, dependable and more or less uniform resource, and they must be assured of a steady market before they can be properly financed.

New semi-chemical processes for pulping wood will make possible the greater economical use of hardwoods. Recent developments in bleaching semi-chemical pulps and the accumulation of information on a wide variety of hardwoods will facilitate the use of the semi-chemical processes for making higher grades of paper, such as book, bond, glassine and specialty papers.

Cold-soda semi-chemical pulping will permit a yield equal in quantity and stronger in quality than the groundwood pulping process. Chemical pre-treatment of hardwood before groundwood pulping can increase the strength of the pulp and at the same time save much energy now consumed in grinding. This is of particular interest in any region where an established groundwood pulping industry is confronted with a rapidly diminishing soft-wood supply.

Traditional sulphite pulping processes discharge waste liquors which create water pollution problems. There are other processes available, in which recoverable bases, such as magnesia, soda and ammonia, are used. These are currently expensive, however, and their commercial use under present economic conditions is slow in spreading. A changed economic situation may stimulate significant improvements in pulping procedures, in which the newer bases will be more extensively used. Moreover, the dissolved solids in spent liquor are a storehouse of undeveloped products.

Spent liquors in pulp mill effluence contain an enormous amount of chemical raw materials. The use of these valuable materials, which are now being lost, should stimulate a broad and basic research effort. Such an effort can result in minimizing problems of waste disposal and in providing a much greater economic return from available wood resources. Already, the list of by-products from spent liquors, made on a commercial or experimental basis, includes plastics, moulding powders, vanillin, tanning agents, water treatment chemicals, dispersing agents, linoleum adhesives, binder for foundry cores or briquettes, ethyl alcohol and yeast.

Wood as it occurs in nature is made up of cellulose, hemicellulose, lignin and various extractives which can be converted by mechanical and chemical means into a variety of fibrous and other products. Cellulose is already employed in the manufacture of rayon and acetate-regenerated fibres. Hemicelluloses, because of their jelling and dispersion properties, are used in pulps for making paper and increasingly as cheap bonding agents. Lignin, which constitutes one-third or more, by weight, of wood in its natural state, can be put to better use as an additive. It is already employed to some extent to improve the flow properties of Portland cement and is used along with plastics, plastic laminates and rubber. With the passage of time, it may also be employed more as an adhesive for linoleum, a binder for sand in foundry moulds, a stabilizer for dirt roads and a soil conditioner. The possible extractives of wood are water-soluble sugars and gums, acids, alcohols and other hydrocarbons, chiefly terpenes and resins and waxes.

Potentially, therefore, mills processing wood into pulp and related products can also be regarded as a plentiful source of raw materials for chemical production. In the laboratory it has been possible by hydrolysis and fermentation to produce wood molasses of a quality which could be employed

for animal feeding. Ethyl alcohol is also made by the fermentation of wood sugar. Research on the hydrogenation of lignin, points to the commercial possibility of producing lubricants and liquid fuels as a by-product of these operations. Although the costs involved are still high, the possibility of wood-based chemicals becoming competitive in some of these larger volume applications before 1980 cannot be entirely ignored.

The short-term outlook for sheet materials made directly from wood appears to be much more promising. Veneer and plywood, because of their uniform character and ease of handling, have already gained wide acceptance in the nation's construction and manufacturing industry. Together with fibre-board and other composite boards, they may also help to improve the economics of processing by making possible the utilization of a wider range of tree species and, at the same time, effectively reduce the volume of mill waste. Further improvements in lathe design and control and in drying, patching and edging equipment are also likely to have a similar effect, namely to conserve and retrieve material which is at present rejected as sub-standard or sold at sacrifice prices.

There is bound to be a growing interest in the possibilities of light-weight composite or sandwich construction. The expression "sandwich construction" is given to an increasing variety of wood products prepared by gluing relatively strong facings over low-density cores. As with laminated wood construction, the great improvement in adhesives is opening up fresh avenues of use, particularly in the construction field. As they are developed for a greater variety of purposes, become more plentiful and fall in price, they will allow facings of wood, plywood, modified wood, fibre products and even metals to be laid over cores of lower quality wood, plywood, fibreboard and paper honeycomb. The designer of the future, by being able to choose his materials in various combinations, will be able to take greater advantage of each, and hence employ wood in its most efficient form.

Fibreboards likewise will be manufactured in an even wider range of sizes and densities. Impregnated or coated to provide for greater strength when wet, or for greater moisture for fire resistance, they may be used increasingly in lieu of exterior and interior finish boards of other kinds. Most of this wood fibre will come from logs cut for the purpose, although fibres from edgings, as well as cull logs and certain sawmill waste, can also be employed. A recent development requiring the use of sawdust, shavings and other millwork waste as its major components is the so-called dry-formed particle board. In this type of board, the waste materials, which otherwise may be burned, are bonded together under heat and pressure with a synthetic resin adhesive. This board exhibits many excellent properties, including dimensional stability and toughness. The greatest present deterrent to their greater production is the high cost of synthetic resin adhesive. Future developments, which may lead to a reduction both in quantity and in the price

of the chemicals involved, will help to ensure a continuing rapid rise in the amount of wood processed in this way.

Marketing and Distribution

From both the supply and the demand sides of the market, long-range economic pressures on the wood-using industries should move them, on balance, toward a higher degree of processing, toward an extension of the range of end products and, for the individual producing units, toward diversification of output. A growing capital intensity, a more skillful and more highly developed technology and the need to increase efficiency in wood utilization—each of these factors will operate, as has already been indicated, to produce these development trends.

On the demand side, similar influences are exerted not only by the growth of markets, but also by their increasing complexity. It has been in the very nature of economic development that the array of goods produced and consumed has been extended, and the growing attention to and expenditure on product research gives assurance that the process is to continue. As in the past—in the packaging field, in synthetic fabrics and in composition or laminated building materials—new product applications for wood will play a part in future developments.

With this increasing diversification at both the industry and the company levels, increased strength and sales stability will result. An integrated mill, for example, turning out both building and packaging materials, may more easily ride out wide and often contrary swings in capital and consumer expenditures. The addition of chemical by-products may further lessen the effects of seasonal or cyclical swings.

Changes in marketing organization extending to wholesale and retail outlets should have similar stabilizing effects. These developments are already taking place. Some of the larger manufacturers of lumber and building supplies are in process of establishing their own chain outlets. With this have come increased promotional activities intended to strengthen the competitive position of the products in question by increasing public awareness or by establishing direct contacts for the purpose of describing to consumers the products and their uses and potentialities.

To these probable trends of diversification and up-grading there is one important qualification, namely, the inhibiting effects of foreign tariff barriers and, so far as can be foreseen, of exchange problems. These might be expected to lessen gradually on the evidence of recent overseas economic trends and the rather hesitant movement toward trade liberalization. Historically, foreign tariffs have played an important part in shaping the structure of our forest industries, permitting expansion in lumber, wood pulp and newsprint that was on a large scale by comparison with the expansion of

other sectors. It is too much to assume that this situation will change quickly, though there might be a gradual liberalization of trade in response to the mounting pressure of world demand on resources, if for no other reason. For the most part, growth and diversification of Canadian forest product output will continue to be geared to the domestic market; fortunately, the prospects are that this market will expand vigorously. Indeed, in the course of domestic market expansion in general, it is possible that the forest products markets in Canada will grow more than proportionately—where, for example, the attainment of a certain level of demand potential makes it possible to start economic production of wholly new commodity lines. In summary, while many supply and market forces will be operating to induce a diversification and up-grading of output, external trade factors will continue to constitute impediments to the full realization of these trends.

Summary

In North America, after many years of relative stability in the use of wood as a raw material, the trends have again turned up: since 1949 wood utilization in Canada and the United States combined has risen by approximately 10%. This trend, though still recent, is encouraging: it indicates that the stronger growth sectors of the wood-using industries are now the main determinants of the over-all trend. For the future, these sectors are expected to continue to grow, and with this growth, a continued expansion in wood use is expected.

We have seen that the forest industries of Canada are based upon an ample resource. Future development, therefore, will be conditioned not by the adequacy of the raw material supply as such, but by the ability to supply economically. In the various ways outlined in preceding paragraphs, and in many ways not yet foreseen, these industries will seek to preserve and improve their competitive position. Thus, in appraising the future for Canada's forest industries, the emphasis shifts to research. We have a generous resource base, and demand trends are reassuring. It remains to bring these two together efficiently and, in this role, technological progress is of paramount importance.

THE EFFECT ON THE REST OF THE ECONOMY

THERE IS no simple way in which the economic effects of a given industry or group of industries can be measured with accuracy. Statistics relating to their gross value of production are too comprehensive in that they include expenditures on goods and services produced in other sectors. Net value of production as reported by the Dominion Bureau of Statistics excludes only outlays on raw materials, fuel and electricity. It therefore exceeds the true "value added" by each industry to the extent of depreciation and payments for business services such as advertising. Data on salaries and wages, on the other hand, tend to cause an understatement of its contribution. They do not account for the fact that capital and certain other resources internal to the industry's operations are also vital to its operation.

These shortcomings being recognized, attempts have been made in Canada and elsewhere to carry out a complete and internally consistent input-output analysis of the national economy, major sector by major sector and industry by industry. Insofar as possible this approach has also been adopted in the following analysis.

Comparisons in respect to international trade are useful. Yet dollar values are, again, "gross" values. Also commodity exports, regardless of their nature, are valued at their point of origin, not at the international boundary. Hence, when an industry is integrated to the extent that it not only produces but also transports its products to their destination outside of Canada, they therefore lead to an understatement of its contribution as an earner of foreign exchange. Import figures are different again. As published in *Trade of Canada*, they reflect the invoice price at point of entry. Provision for freight, insurance and handling charges and duties and other taxes must consequently be made if the delivered cost to the importer is to be properly evaluated.

Industries which purchase some part of their raw materials abroad, buy some of their machinery and equipment elsewhere, or are owned outside of

Canada further complicate matters. Tending to offset the sale of the industry's products outside of Canada are foreign expenditures on supplies and equipment and the payment of interest and dividends abroad. Allowances of this kind must therefore be made if the industry's net earnings of foreign exchange are to be properly assessed.

Investment expenditures covering new construction and the purchase for the first time of plant and equipment are also significant. However, as reported by the Dominion Bureau of Statistics, they do not include amounts spent on such other "transfer" payments as the purchase of land, buildings and other existing physical assets. In some instances they therefore fall short of the industry's own balance sheet accounting of capital investment by as much as 10% or even 20%. Also, there is the matter of import content. The direct effect upon the Canadian economy of an investment programme, the associated demands of which are essentially for the services of Canadian contractors and Canadian building materials and equipment, is obviously greater than another of comparable size whose capital goods are largely produced elsewhere.

In this chapter, each of these measures is reviewed in turn. Where possible, each industry's output has been measured in terms of Gross Domestic Product, an approximation which is itself directly comparable with such economic aggregates as Gross National Product. However, since detailed input-output analyses have been carried out only for the year 1949, such long-run series as net value of production, employment, commodity exports and new capital investment have frequently been used in their stead.

Value of Production

Estimates of future production have already been considered in volume terms. In order to convert these into dollar figures, price estimates have also been prepared. A rise relative to the general price level results, naturally enough, in even higher value figures; no change in real price, in a parallel movement in output values; and, where applicable, a decline in relative price, in a falling behind of the value-of-production series.

Table 80 summarizes the information available for 1955 and includes estimates for 1980. It indicates that the gross value of output of Canada's primary forest industries will more than double over the next quarter century. Sales of forest products may rise from around \$1.9 billion in 1955 to approximately \$4 billion 25 years later. This relative increase may be closely approximated by the value of output of woods operations. Here a volume increase of approximately 50%, combined with a rise in real price in the order of 30%, may cause the gross value of production of wood in the round to rise from \$850 million in 1955 to somewhere in the vicinity of \$1,700 million in 1980.

Table 80

ESTIMATED VALUE OF PRODUCTION, 1955 AND 1980
(value in 1955 constant dollars)

Industry category	1955 (millions of dollars)	1980 (millions of dollars)
Woods operations (gross value).....	850 ^a	1,700
Wood processing (net value).....	1,051	2,300
Sawmills.....	305	600
Veneer and plywood mills.....	56	150
Pulp and paper mills.....	690	1,550
Grand total.....	1,901	4,000

^a Estimated from 1954 published data.

In respect to processing, the greatest relative expansion is expected to take place in the production of veneer and plywood. Meanwhile the value added by sawmills may rise at a somewhat lower rate than that achieved by the nation's pulp and paper mills. Following more or less in line with the lumber and pulp and paper volume increase described earlier in this study, the former may rise by nearly 100% and the latter by about 120% during the quarter century under review.

These statistics, though they give an impression of relative rates of growth, must first be reduced to the extent of purchases from other sectors of the economy if they are to be used in a direct comparison with Gross Domestic Product. The conversion made in Table 81 also indicates that Canada's forest industries are likely to decline, relatively, in importance. Although they account for better than 10% of the output of Canada's commodity producing industries and about 5% of total economic activity in this country in 1955, they may fall to around 8% and 4% respectively in 1980.

Table 81

**ESTIMATED GROSS DOMESTIC PRODUCT AT FACTOR COST
1955 AND 1980**
(value in 1949 constant dollars)

Industry category	1955 (millions of dollars)	1980 (millions of dollars)
Woods operations.....	406	845
Wood processing.....	646	1,425
Sawmills ^a	239	525
Pulp and paper.....	407	900
Grand total.....	1,052	2,270
Total commodity industries.....	10,000	30,000
Percent.....	10.5	7.6
Total Canada.....	19,390	55,400
Percent.....	5.4	4.1

^a Including veneer and plywood mills.

Since the mid 1920's forest industries have, collectively, generated between 4% and 6% of Canada's total domestic product; yet the proportion has varied considerably from one 5-year period to the next. In the early 1930's, output fell sharply in relation to other sectors of the economy, only to recover almost as quickly to reach an all-time high of 6% in 1937. This trend is summarized in Table 82, "Gross Domestic Product at Factor Cost 1926-55 and Estimated 1980". A similar drop occurred during World War II as a shortage of woods labour on the one hand and increased production in other industries on the other made themselves felt. Since 1950 the forest industries have accounted for approximately 5.5% of Canada's national output of goods and services.

Employment

Another measure of growth is direct employment. The nation's forest industries currently provide full-time jobs (or the equivalent) for 280 thousand Canadians. The number of jobs so provided in the woods and in this country's lumber and pulp and paper mills has risen by approximately 50% since the late 1920's. Viewed in its national perspective, this record is one of relative stability. Approximately 5% of the nation's total labour force were working in these industries in 1928 and, again, in 1955.

The proportion employed in woods operations also has shown little change. Around 55% of the forest industry's labour force derived their livelihood from logging and related activities both in the late 1920's and in the early 1950's. As far as processing is concerned, employment in the pulp and paper and in the veneer and plywood mills has gained in relation to the total. The sawmills, meanwhile, have shown a modest decline. Although pulp and paper accounted for around 20% of total forest industry employment 30 years ago, its contribution is now in the order of 22%. The new veneer and plywood mills—virtually all of them built since the 1930's, at present provide jobs for around 4%. Meanwhile lumber manufacturing, though still gaining in absolute numbers, has fallen from 25% of the total in 1926 to around 21% at the present time.

Estimates looking ahead as far as 1980 are even more difficult to prepare than those pertaining to total values of production or sales. The relative contribution of labour and capital must be assessed. Man-hour productivity gains must be assumed. And finally, a further reduction of the average working week must be taken into account. Each of these factors was taken into account prior to arriving at the estimates of employment 25 years hence, as given in Table 83.

Advantage, where possible, has been taken of historical data. The past long-run relationships between gross and net values of production and salaries and wages have been projected into the future. In connection with

Table 82

GROSS DOMESTIC PRODUCT AT FACTOR COST, 1926-55 AND ESTIMATED 1980
(millions of 1949 constant dollars)

Period	Woods operations	Lumber and other wood	Pulp and paper	Forest industries total	Forest industries percentage	
					Commodity industries total	Canada total
1926-30	191	117	136	443	4,351	8,761
1931-35	135	66	127	328	3,645	7,413
1936-40	207	107	171	485	4,816	9,225
1941-45	225	142	217	583	7,403	14,427
1946-50	313	184	310	807	7,116	14,472
1951	406	209	372	986	8,473	16,731
1952	373	201	355	929	8,806	17,636
1953	357	217	363	937	9,102	18,341
1954	379	214	384	977	8,452	17,806
1955	406	239	407	1,052	10,000	19,390
1980	845	525	900	2,270	29,700	55,400
Percentage change					+116	+197
1955-80		+108	+119	+121		+187

NOTE: Because of rounding, figures do not add in all cases.

EMPLOYMENT IN THE FOREST INDUSTRIES, 1926-55 AND ESTIMATED 1980

(thousands of persons)

Period	Woods operations ^a	Pulp and paper	Lumber	Plywood and veneer	Forest industries total	Canada total	Forest industries as percentage of total Canada
1926-40.....	91	33	43	Not separated	167	3,524	4.7
1931-35.....	66	26	21		114	3,404	3.3
1936-40.....	87	32	33		152	3,779	4.0
1941-45.....	114	38	47	prior to 1946	199	4,364	4.6
1946-50.....	140	50	55	6	251	4,825	5.2
1951.....	158	57	62	7	284	5,110	5.6
1952.....	149	58	61	8	276	5,224	5.3
1953.....	136	58	61	9	264	5,278	5.0
1954.....	146	61	57	9	273	5,231	5.2
1955.....	150	62	60	10	282	5,328	5.3
1980.....	200	85	70	15	370	9,637	3.8
Percentage change 1955-80.....	+33	+37	+17	+50	+31	+81	
Annual percentage increase of man-hour productivity 1955-80.	1.5	2.5	2.0	2.5			

Note: Because of rounding, figures do not add in all cases.

^a Estimated annual average.

woods operations, salaries and wages have risen from around 35% of the gross value of primary forest products produced in Canada to a 1955 level of approximately 60%. Even higher figures were reported during the 1940's when new equipment was much more difficult to obtain. One was approximately two-thirds of the other in 1942, 1943 and again in 1946 and 1947. It was assumed that a 60-40 relationship would apply in 1980.

When it came to processing, net rather than gross values of production were used as a point of departure. The ratio of salaries and wages to saw-mill output, in contrast to logging and other woods operations, has declined, as is indicated in Table 84, for periods between 1926 and 1955. It was in the order of 60% in the late 1920's. In 1955, on the other hand, expenditures on labour were approximately half of the net value of production of the nation's lumber manufacturing plants. A further drop to approximately 40% was assumed to apply to the end of the forecast period under review.

Table 84

THE LUMBER INDUSTRY, 1926-55

Period	Salaries and wages (millions of dollars)	Net value of production (millions of dollars)	Salaries and wages as percentage of net value of production
1926-30.....	33.7	55.8	60.4
1931-35.....	13.8	21.9	63.0
1936-40.....	26.9	45.7	58.9
1941-45.....	49.2	91.9	53.5
1946-50.....	90.8	188.4	48.2
1951.....	132.1	271.9	48.6
1952.....	135.5	261.3	51.9
1953.....	142.1	269.1	52.8
1954.....	139.6	263.6	53.0
1955.....	152.1	305.4	49.8

Salary and wage costs in Canada's pulp and paper mills, meanwhile, have shown no definite trend either way, and are given by periods in Table 85. Expenditures on this account were approximately 40% of Canada's net value of pulp and paper output 30 years ago and about 37% in the early 1950's. Throughout the 1930's they were somewhat higher, around 45%, owing to both a decline in investment outlays and a fall in the unit cost of raw materials. By contrast, they were below 40% in the late 1940's when new construction began to get under way on a large scale and increased wages paid to woods labour was making itself felt in the form of increased expenditures on raw materials. In the foregoing calculations it was assumed that the long-run 40-60 relationship between salaries and wages and net value of pulp and paper mill production would persist through to 1980.

Table 85

THE PULP AND PAPER INDUSTRY, 1926-55

Period	Salaries and wages (millions of dollars)	Net value of production (millions of dollars)	Salaries and wages as percentage of net value of production
1926-30.....	46.6	113.9	40.9
1931-35.....	31.8	73.5	43.3
1936-40.....	46.3	108.4	42.7
1941-45.....	72.2	171.7	42.1
1946-50.....	141.9	392.3	36.2
1951.....	213.2	679.3	31.4
1952.....	225.4	584.1	38.6
1953.....	235.7	599.9	39.3
1954.....	252.6	641.4	39.4
1955.....	265.3	689.8	38.5

The statistical record presented in Table 86 is less conclusive so far as veneer and plywood mills are concerned. Labour as an element of cost has ranged five points either way of 50% over the last decade. On the grounds that further mechanization may offset a further rise in mill wage rates, it was again assumed that this relationship would apply to 1980.

Table 86

THE VENEER AND PLYWOOD INDUSTRY, 1944-55

Period	Salaries and wages (millions of dollars)	Net value of production (millions of dollars)	Salaries and wages as percentage of net value of production
1944.....	6.5	14.0	46.4
1946-50.....	11.5	22.7	50.7
1951.....	18.2	40.7	44.7
1952.....	20.6	38.4	53.6
1953.....	25.5	53.3	47.8
1954.....	26.4	50.9	51.9
1955.....	31.1	56.1	55.4

The greatest likelihood of an improvement in labour productivity appears to be at the mill—particularly at mills manufacturing pulp and paper products. There seem to be fewer impediments to a reduction in the number of man-hours per unit of physical output than in woods operations. In arriving at 25-year employment estimates, annual productivity gains of 2½% were assumed to apply to pulp and paper and veneer and plywood mill activity. Rates of 2% and 1½% per year were applied when it came to lumbering and logging. A uniform reduction of 15% in the average number of hours worked per week was also expected to take place over the 25-year interval from 1955 to 1980. Productivity trends in the lumber and pulp and paper industries by periods from 1926 to 1953 are presented in Table 87.

A comparison between employment in these industries and Canadian employment is of interest. Currently one is approximately 5% of the other.

Twenty-five years hence the forest industries, together, may provide jobs for approximately 4% of Canada's total labour force.

Table 87

PRODUCTIVITY TRENDS BY PERIODS, 1926-53

Period	A	B	C	D
	Net value (thousands of dollars)	Net value, wholesale price index (1935-39 = 100) (thousands of dollars)	Employment (number)	$\frac{B}{C}$
<i>The lumber industry</i>				
1926-30.....	55,810	50,258	42,892	1.2
1931-35.....	21,920	26,368	21,351	1.2
1936-40.....	45,705	42,699	33,152	1.3
1941-45.....	91,853	55,536	44,876	1.2
1946-50.....	188,441	62,512	55,058	1.1
1951.....	271,866	59,450	62,415	0.95
1952.....	261,326	59,691	60,931	1.0
1953.....	269,066	64,186	60,933	1.1
<i>The pulp and paper industry</i>				
1926-30.....	113,875	86,097	33,036	2.6
1931-35.....	73,497	73,063	26,019	2.8
1936-40.....	108,426	101,293	31,872	3.2
1941-45.....	171,698	118,737	38,014	3.1
1946-50.....	392,308	196,081	50,246	3.9
1951.....	679,258	272,030	57,291	4.7
1952.....	584,101	256,185	57,803	4.4
1953.....	599,935	290,244	58,194	5.0

Foreign Trade

Probably the outstanding economic characteristic of the forest industries has been their continuing dependence on foreign markets for the major part of their demand. Moreover, pulp, newsprint, and softwood lumber, as a group, have long rivalled the agricultural and mineral groups for leadership in Canada's total commodity exports. In recent years, forest products have had a substantial edge over primary minerals, and have surpassed agricultural products in total value. They made up from 32% to 36% of commodity exports, pulp and paper providing about 23% and lumber about 10%.

By 1980 it is estimated that total commodity exports will have risen about 150% in real terms above the 1955 level, with strong support from metals and fuels in particular. Meanwhile, forest products exports are expected to increase by 80% or 90% in this period. Pulp and paper exports may slightly more than double, while in real value lumber exports might be 60% above the high 1955 level although about double the lower average for 1952-54 on which this projection was based. Although their share of the total may decline from the present 35% to about 25% in 1980, forest products will nonetheless continue to exert a dominant influence on Canada's commodity trade. Statistics on exports of forest products are given in Tables 88 and 89.

Table 88

CANADIAN EXPORTS BY PERIODS, 1926 TO 1955, AND ESTIMATED 1980
(millions of current dollars)

Period	Primary forest products	Pulp and paper	Lumber and other wood	Forest products total	Canada exports total	Percentage of Canada total		
						Total forest products	Pulp and paper	Lumber and other wood
1926-30	28	184	69	280	1,165	24.0	15.8	5.9
1931-35	11	115	31	157	596	26.3	19.3	5.2
1936-40	20	170	66	255	975	26.2	17.4	6.8
1941-45	30	273	116	419	2,723	15.4	10.0	4.3
1946-50	54	585	252	892	2,855	31.2	20.5	8.8
1951-55	85	939	375	1,399	3,914	35.7	24.0	9.6
1952	94	914	359	1,367	4,301	31.8	21.3	8.3
1953	65	888	343	1,296	4,117	31.5	21.6	8.3
1954	67	927	384	1,378	3,876	35.5	23.9	9.9
1955	66	991	460	1,517	4,282	35.4	23.1	10.7
1980	90	2,040	755	2,885	10,920	26.4	18.7	6.9
Percentage change 1955-80	+36	+106	+64	+90	+155			

NOTE: Figures do not add because of rounding.

Table 89

**VALUE OF EXPORTS OF FOREST PRODUCTS, 1955
AND ESTIMATED 1980**

(millions of 1955 constant dollars)

Product	1955	1980
Primary forest products ^a		
Pulpwood.....	49	60
All other.....	16	30
Sawn lumber and timber ^b	394	640
Shingles.....	29	30
Veneer and plywood.....	30	40
Building and insulation boards.....	6	5
Other manufactured wood products.....	7	10
Wood pulp.....	297	660
Paperboard.....	5	15
Newsprint.....	667	1,330
Other papers.....	16	30
Total.....	1,516	2,850

a Including Christmas trees, logs, bolts, fence posts, piling, poles and pitprops.

b Including squared timbers, railway ties, billets, laths, pickets and spoolwood.

In order to assess Canada's balance of trade in respect to wood and other forest products, imports also have to be taken into account. Exclusive of such fully manufactured articles as books and periodicals, they amounted, in value, to approximately \$122 million in 1955. The great majority of these imports came from the United States. Also, they were weighted heavily with semi-manufactured wood and paper products as opposed to wood in its raw or unprocessed forms. Of the total, approximately one-third might be classified as paper products and one-quarter consisted of sawn lumber and timbers. Primary forest products constituted about 10% of this country's total foreign purchases of wood and paper products.¹

These shipments from outside sources include exotic tropical woods used in the manufacture of furniture veneers, cork, oak for flooring and a considerable quantity of pine lumber. A certain amount of pulpwood, sulphite pulp and certain other wood and paper products is, at times and in certain localities, more conveniently imported than purchased from sources within the country. A different situation prevails with respect to plywood, the principal external source of which is now Japan. In this case foreign producers, having the advantage of much lower labour costs, have been able to gain a much more substantial share of the Canadian market.

Over the next 25 years the demand for forest products based on wood which is not grown in this country will probably increase. So will convenience shipments of semi-processed wood and paper materials. Meanwhile,

¹In 1955 the value of Canada's imports of wood and paper products could be broken down as follows: (1) primary forest products \$10.8 million; (2) sawn lumber and timbers \$26.6 million (of which tropical woods accounted for \$1.7 million, hardwood lumber \$12.3 million and softwood lumber \$12.6 million); (3) veneer and plywood \$4 million; (4) cork and other wood products \$20.6 million; (5) wood pulp (chiefly sulphite) \$7.7 million; (6) building boards \$4.8 million; (7) pulpboard and paperboard \$10.1 million; and (8) other mill-run paper products \$37.9 million. Total imports for that year were valued at \$122.5 million.

because of the growing market in Canada, certain of the more highly manufactured products may be produced in this country. With these various considerations in mind, the total value of imports of all forest products entering Canada in 1980 has been estimated to be in the order of \$150 million.

In order to arrive at an over-all balance in commodity trade, imports must be deducted from exports. In 1955 net earnings of foreign exchange, arrived at in this way, were in the order of \$1.4 billion. On the basis of the foregoing estimates, earnings of foreign exchange due to the exportation of Canadian produced forest products might exceed the total value of imports by some \$2.7 billion.

Investment

In order to achieve these objectives large amounts of capital will have to be invested in forest development, in the provision of new logging and transportation facilities and in the re-equipment and expansion of processing facilities. In the majority of these, outlays will be aimed at improving physical levels of output in order to offset the expected rise in salaries and wages and in costs stemming from the expected advance in the general levels of income.

Table 90 shows capital investment in the Canadian forest industries by periods from 1926 to 1955. A glance at past trends indicates that annual capital expenditures both in the nation's pulp and paper mills and in its sawmills have reached, or surpassed, those reported for the late 1920's. Certainly these outlays (allowance being made for the lower purchasing power of the dollar) have trended more persistently upward. In respect to woods operations, such estimates as are available suggest a much greater long-run increase. Investment in new logging roads, machinery and equipment, and other facilities may have doubled or even tripled over the past 30 years.

It is interesting to note, in passing, that outlays on machinery and equipment in all phases have risen in relation to expenditures on new construction.

Table 90

CAPITAL INVESTMENT IN CANADIAN FOREST INDUSTRIES, 1926-55

(annual average in millions of current dollars)

Period	Woods operations	Wood and wood products	Pulp and paper products
1926-30	6.3	13.9	38.2
1931-35	2.9	5.3	5.1
1936-40	5.0	8.7	8.8
1941-45	9.3	12.7	13.2
1946-50	27.0	27.5	76.6
1951-55a	48.2	37.1	116.6

a For comparison, the average annual investment during 1951-55 in the particular industries was:

Sawmills	\$ 20 million
Veneer and plywood	5 million
Pulp and paper mills	95 million
Total	\$120 million

During the past few years expenditures in the pulp and paper mills have accounted for more than half of the total. Meanwhile, woods operations, designed to produce either pulpwood or sawlogs, have accounted for about one-quarter of the total capital expenditures reported by the forest industries. Average annual figures for the five years from 1951 to 1955 show expenditures to have been about as follows: forestry operations, \$48 million; sawmills, \$20 million; veneer and plywood, \$5 million; and new investment in pulp and paper mill construction and machinery and equipment, \$95 million.

Over all, it is expected that the annual level of investment will slightly more than double during the 25-year period under review. The average annual figure of new investment for the last 5-year period has been \$202 million. In 1980 it may be more in the order of \$350 million. Of this, the erection and equipment of new pulp and paper facilities may account for 50%, and new lumber and veneer and plywood milling facilities for another 20%. Were this to be the case, capital expenditures designed to improve growing and harvesting conditions might rise to more than one-third of the total.

These are large amounts of money. They are required to be invested in sectors of the industry which have been much more labour- than capital-intensive in the past. Organizational and other structural changes, such as the progressive integration of pulp and paper and lumbering operations, should help to make the necessary funds available. If, however, the progressive substitution of capital for labour on some such scale as this proves impossible, productivity in Canada's forest industries will suffer, and the quantitative forecasts outlined earlier in this report will prove less likely of attainment.

GENERAL OBSERVATIONS

1. FROM WHAT has been said previously it would appear that Canada possesses sufficient forest resources to support the increase in demand for wood which this country is likely to experience over the next quarter century. Without exception, the allowable cut estimated for each region has been shown to be well above the total drain inclusive of the commercial cutting operations and the fire, insect and disease losses forecast for 1980. These broad statements, however, require qualification. It is not at all certain that the requisite volume of wood will be available at a cost which will permit it to be sold in competition with other materials and with the products of the forest industries of other countries. Much depends upon the success of efforts devoted to reducing fire, insect and disease losses and the ingenuity with which management tackles the problem of increasing yields and reducing logging, transportation and processing costs.

2. The confident tone with which the preceding production forecasts have been described derives from the expectation that those engaged in Canada's forest industries will, over the next 25 years, obtain much greater knowledge of the nation's resources; also that substantial progress will be made in reducing forest fire and insect and disease losses.

It is therefore presumed that much more will be known about the silvical characteristics of Canadian tree species and the ecological relationships of the associations in which they occur. Forest site classification systems must be developed to the point where their economic implications can be effectively translated into new and improved forestry practices.

When it came to estimating losses, information sufficient for the preparation of over-all estimates was sparse or incomplete. It is confidently expected, however, that over the next quarter century, measures such as the aerial spraying of the spruce budworm infestation in Quebec and New Brunswick will yield results which can be assessed in economic as well as technical terms. Also, as work on the national forest inventory progresses and more

effective measures to combat catastrophic fire losses are developed, it will become possible to quantify the changing extent and economic worth of the nation's timber resources. In recognition of results already achieved and programmes now under way, it has been estimated in this study that forest fire losses will be reduced by about one-half, and that the over-all drain due to insects and disease will be brought down to about 35% of its present level.

3. Future advances in forest management practices are likely to be most effective in the nation's more accessible forest areas. Application of silvicultural methods, in other words, is likely to be of greatest benefit in respect to limits which are close by, or reasonably accessible to, existing mills. Although a westward shift will be in evidence, technological and administrative advances in this field will tend to perpetuate the present locational structure of Canada's forest industries.

Private holdings, both those held by operating companies and those held by individuals, will probably receive the greatest attention. These areas, which include many farm woodlots, are potentially among the most productive in the country. Already there is a tendency on the part of woodlot owners to move toward long-term planning for continuous timber production. As wood requirements rise, owners of forested lands will have greater incentive to employ known techniques for increasing their output.

4. Operations which will permit timber of different sizes and of different tree species to be allocated to the purpose for which it is best suited, offer economies at all levels. The tendency, therefore, will be for traditionally separate industries, such as sawmilling, pulp and paper production and the manufacturing of plywood, composite boards and other sheet products, to join forces. Physical wastage can be reduced, previously rejected material being converted into a variety of commercial products. Trees can be used more selectively, those of appropriate dimensions and quality being converted into commodities which bring the highest prices. The elimination of legislation and other institutional obstacles tending to prevent the progressive integration of these various activities will increase the returns both to the operators and to the owners of Canada's forest resources.

5. Greater product diversification is also advantageous from the point of view of stabilizing income and raising new capital. The fortunes of firms whose plants produce a variety of wood products are usually less vulnerable to such short-term swings in demand and price as frequently affect individual commodities in primary industries. To the extent that they are able to sell various products in different sectors of the economy (and on both the domestic and the export market), they will be insulated against the market swings which are more likely to affect the comparatively small or single-line producer of forest products. Their ability to raise new capital and to employ these funds in the improvement of their forest resources, transportation facil-

ties and manufacturing plants, will also be enhanced. One may therefore expect to see the larger, more highly integrated and more diversified producers growing more rapidly and at times absorbing or replacing those of a simpler and less stable character.

6. Where markets are available, the trend will be toward an even greater degree of manufacturing. Many users of wood products (and particularly those in the construction field) will be attempting to reduce on-site labour. Forest industries which produce a more highly processed product have a greater opportunity to offset such increases in raw material costs as are likely to result from a rise in the price of wood delivered to the mills. Canadian producers who are able to convert a goodly proportion of their output into highly manufactured wood products are, therefore, likely to be in a stronger competitive position than others who are unable to sell wood in other than raw or lightly manufactured form.

7. With increasing competition from other materials (and among the various wood products themselves) there is a growing need for market data and market analysis. The Canadian forest industries are at a disadvantage in this respect. Little information exists as to the uses to which many forest products are put. Some of the market estimates contained in this study have had, for example, to be constructed from experience in the United States. Little is known about the consumption pattern of lumber. The same applies to plywood and veneer. National and regional statistics on pulp and paper end uses are also lacking.

8. Published information pertaining to Canada's total wood production has not heretofore been complete. It was, therefore, necessary for our Study Group to make provisional estimates of total annual primary forest production. This deficiency was particularly noticeable with respect to fuelwood production. In both this study and that published separately by the Commission, entitled *Canadian Energy Prospects*, it was necessary to reduce by one-half the amount of fuelwood reported as having been produced in this country. The inadequacy of statistics on primary forest production was particularly evident in the case of privately owned forest lands, in which estimates of production are obtained mainly from census returns.

As long as Canada's forest industries continue to lack information of this character, they will be at a disadvantage. It is our view that only when better statistical data are made available and put to use by individual companies, trade associations and government departments for purposes of economic analysis, are the marketing techniques which have already been used to advantage in other industries likely to be of substantial benefit to the forest industries of Canada.

Appendix A

REFERENCE DATA

1. Net Value of Canadian Forest Industries, 1926-54 (Table 91, Figure 33).
2. Net Value of Canadian Forest Industries by Provinces, 1926-54 (Table 92, Figure 34).
3. Employment in Canadian Forest Industries, 1926-54 (Table 93, Figure 35).
4. Canadian Primary Forest Products Exported, 1926-54 (Table 94, Figure 36).
5. Canadian Wood, Wood Products and Paper Exported, 1926-55 (Table 95, Figure 37).
6. Canadian Wood Pulp Production, 1926-55 (Table 96, Figure 38).
7. United States Wood Pulp Production, 1926-54 (Table 97, Figure 39).
8. Canadian Wood Pulp Exported, 1926-55 (Table 98, Figure 40).
9. Canadian Paper Production, 1926-55 (Table 99, Figure 41).
10. Canadian Paper Exported, 1926-55 (Table 100, Figure 42).
11. Production Trends for Selected Materials, North America, 1926-55 (Table 101, Figure 43).

Table 91

NET VALUE OF CANADIAN FOREST INDUSTRIES, 1926-54
(millions of dollars)

Year	Woods operations	Lumber industry	Pulp and paper industry	Wood-using industries	Paper-using industries	Total
1926.....	174	55	110	58	16	413
1927.....	174	55	111	62	19	421
1928.....	181	58	120	68	21	448
1929.....	187	62	122	73	22	466
1930.....	176	48	108	63	22	417
1931.....	120	25	88	45	20	298
1932.....	78	15	67	32	16	208
1933.....	80	16	57	27	16	196
1934.....	82	25	77	30	19	233
1935.....	90	29	79	32	20	250
1936.....	109	36	86	37	22	290
1937.....	132	47	106	43	27	355
1938.....	116	39	89	40	26	310
1939.....	124	45	103	44	27	343
1940.....	150	62	158	55	34	459
1941.....	170	77	175	72	43	537
1942.....	173	91	165	83	48	560
1943.....	205	92	164	91	51	603
1944.....	236	97	174	105	56	668
1945.....	267	103	181	109	61	721
1946.....	324	129	258	131	76	918
1947.....	407	191	356	179	87	1,220
1948.....	461	197	413	209	97	1,377
1949.....	447	186	423	208	109	1,373
1950.....	491	239	511	225	127	1,593
1951.....	608	272	679	257	149	1,965
1952.....	662	261	584	273	152	1,932
1953.....	643	269	600	308	168	1,988
1954.....	629	264	641	303	161	1,998

NET VALUE OF CANADIAN FOREST INDUSTRIES, 1926-54

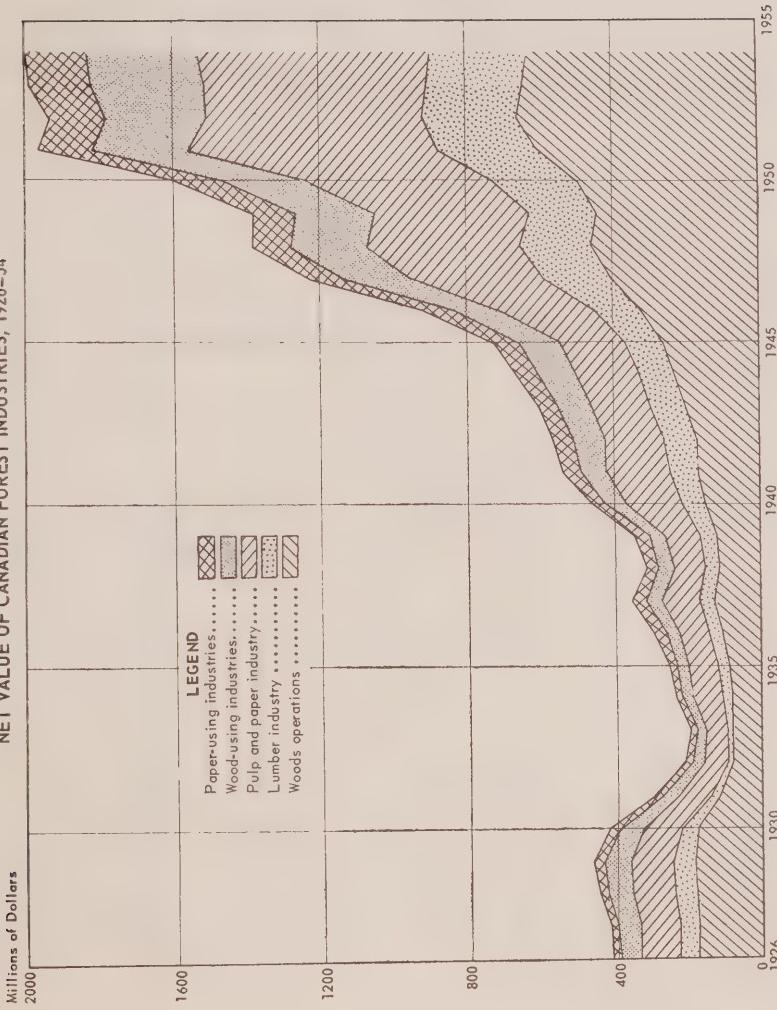


Figure 33

Table 92

**NET VALUE OF CANADIAN FOREST INDUSTRIES
BY PROVINCES, 1926-54**

(millions of dollars)

Year	Atlantic Provinces	Quebec	Ontario	Prairie Provinces	British Columbia	Total
1926.....	36	135	146	14	82	413
1927.....	36	142	142	19	82	421
1928.....	32	152	155	20	89	448
1929.....	34	153	162	25	92	466
1930.....	35	147	138	24	73	417
1931.....	29	101	104	18	46	298
1932.....	23	74	71	9	31	208
1933.....	20	69	65	8	34	196
1934.....	26	82	74	9	42	233
1935.....	27	85	81	10	47	250
1936.....	28	99	90	12	61	290
1937.....	36	122	110	14	73	355
1938.....	32	100	98	12	68	310
1939.....	33	121	105	13	71	343
1940.....	46	169	132	18	94	459
1941.....	50	192	159	23	113	537
1942.....	54	202	168	24	112	560
1943.....	61	219	182	28	113	603
1944.....	65	251	190	32	130	668
1945.....	68	273	203	35	142	721
1946.....	87	350	264	42	175	918
1947.....	109	437	343	52	279	1,220
1948.....	117	478	403	61	318	1,377
1949.....	147	466	406	62	292	1,373
1950.....	160	523	454	71	385	1,593
1951.....	213	635	548	82	487	1,965
1952.....	217	627	541	94	453	1,932
1953.....	200	655	561	95	477	1,988
1954.....	194	653	550	91	510	1,998

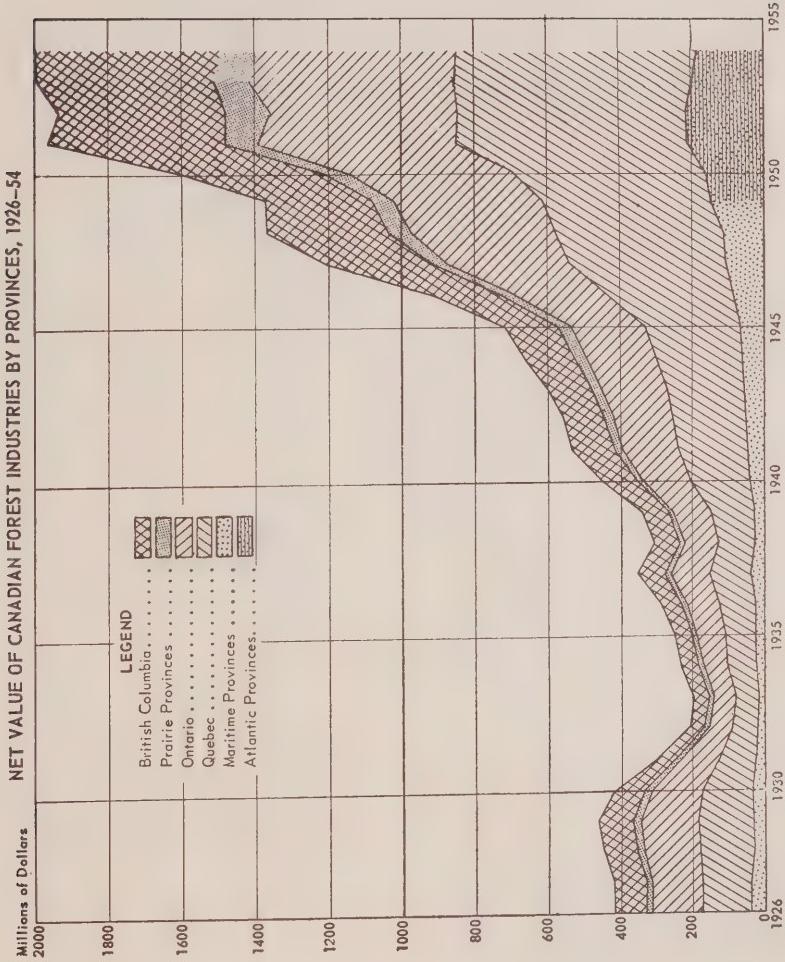


Figure 34

Table 93

EMPLOYMENT IN CANADIAN FOREST INDUSTRIES, 1926-54
(thousands of employees)

Year	Woods operations ^a	Lumber industry	Pulp and paper industry	Wood-using industries	Paper-using industries	Total
1926.....	81	35	31	31	8	186
1927.....	86	45	33	33	8	205
1928.....	103	45	34	37	8	227
1929.....	97	47	34	39	9	226
1930.....	90	44	33	36	9	212
1931.....	52	22	27	29	9	139
1932.....	60	18	24	25	8	135
1933.....	65	18	24	23	8	138
1934.....	74	23	27	25	9	158
1935.....	79	25	28	27	9	168
1936.....	90	29	29	29	10	187
1937.....	100	34	33	32	11	210
1938.....	71	31	31	30	12	175
1939.....	75	33	31	31	12	182
1940.....	100	39	35	36	13	223
1941.....	108	45	37	42	16	248
1942.....	112	48	38	44	17	259
1943.....	108	44	37	45	18	252
1944.....	118	44	38	49	19	268
1945.....	122	44	40	51	21	278
1946.....	139	49	45	58	23	314
1947.....	145	55	50	68	24	342
1948.....	148	57	52	70	24	351
1949.....	126	55	52	67	24	324
1950.....	143	59	52	67	25	346
1951.....	158	62	57	69	26	372
1952.....	149	61	58	70	25	363
1953.....	136	61	58	74	26	355
1954.....	135	57	61	72	26	351

^a Man-year basis.

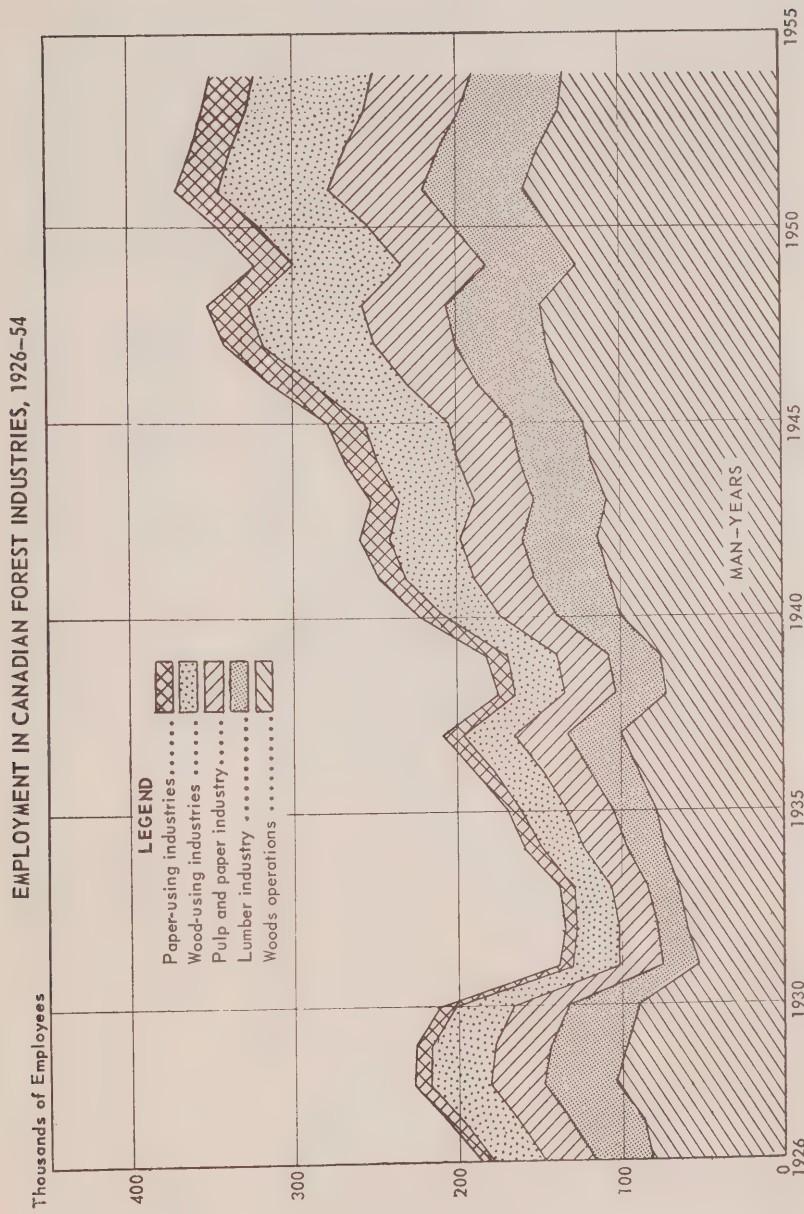


Figure 35

Table 94

CANADIAN PRIMARY FOREST PRODUCTS EXPORTED, 1926-54
(millions of cubic feet)

Year	Logs and bolts	Pulpwood	All other	Total
1926.....	65	118	39	222
1927.....	66	131	55	252
1928.....	59	130	54	243
1929.....	55	110	60	225
1930.....	42	113	48	203
1931.....	46	95	17	158
1932.....	36	53	13	102
1933.....	50	61	15	126
1934.....	47	87	19	153
1935.....	60	94	23	177
1936.....	52	105	22	179
1937.....	50	145	25	220
1938.....	48	149	20	217
1939.....	59	131	36	226
1940.....	42	132	52	226
1941.....	59	158	34	251
1942.....	30	169	29	228
1943.....	12	131	29	172
1944.....	16	127	44	187
1945.....	11	142	45	198
1946.....	10	158	70	238
1947.....	10	169	74	253
1948.....	15	197	68	280
1949.....	12	137	55	204
1950.....	11	147	35	193
1951.....	8	244	42	294
1952.....	10	212	72	294
1953.....	9	149	50	208
1954.....	9	151	48	208

CANADIAN PRIMARY FOREST PRODUCTS EXPORTED, 1926-54

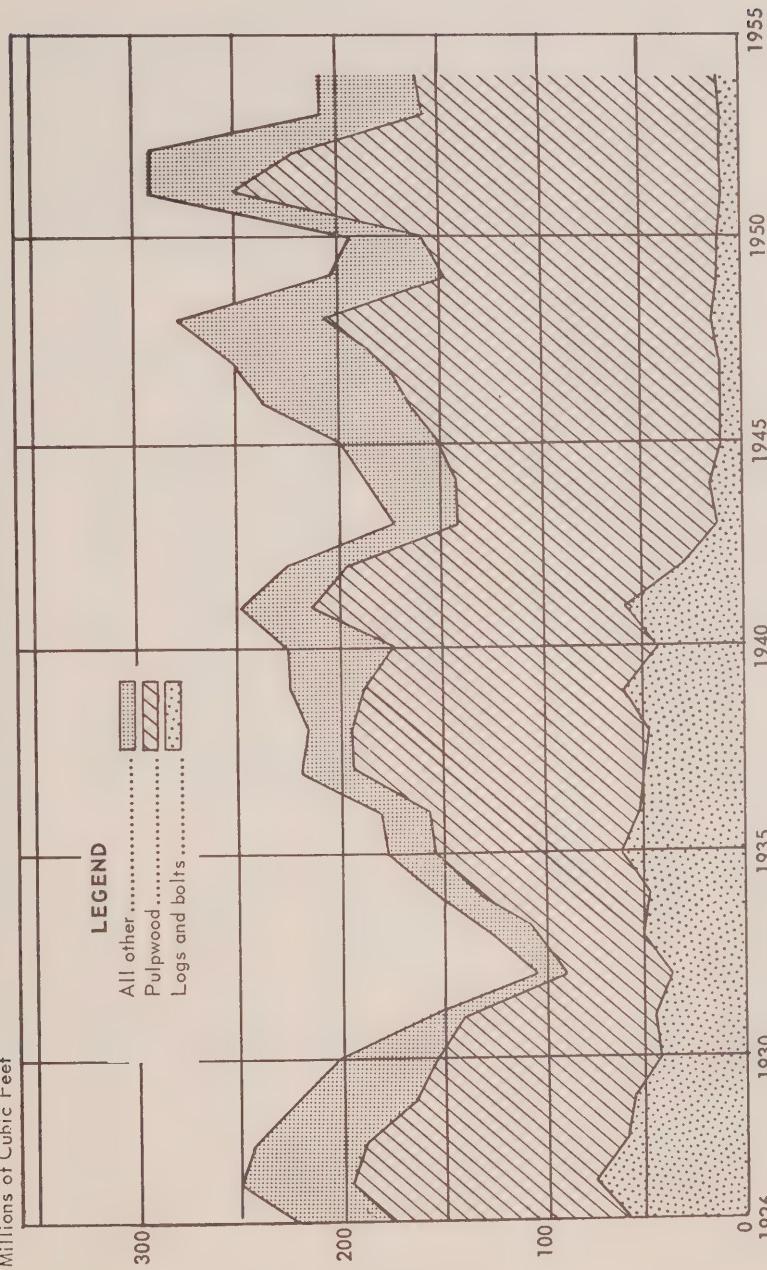


Figure 36

Table 95

**CANADIAN WOOD, WOOD PRODUCTS AND PAPER
EXPORTED, 1926-55**

(millions of dollars)

Year	Primary forest products	Lumber	Other wood products	Wood pulp	Newsprint	Other paper products ^a	Total
1926.....	28	65	19	52	114	7	285
1927.....	30	60	14	47	123	6	280
1928.....	29	51	15	46	141	6	288
1929.....	27	54	12	43	149	6	291
1930.....	24	40	7	39	133	5	248
1931.....	13	22	9	30	107	4	185
1932.....	8	14	6	19	83	3	133
1933.....	9	19	7	24	69	3	131
1934.....	11	28	8	25	83	5	160
1935.....	13	27	13	28	88	6	175
1936.....	14	39	14	31	104	7	209
1937.....	20	48	16	42	126	10	262
1938.....	20	37	13	28	105	8	211
1939.....	21	51	14	31	116	8	241
1940.....	25	70	20	61	151	20	347
1941.....	26	75	23	86	154	22	386
1942.....	28	81	25	95	141	17	387
1943.....	26	75	27	100	145	16	389
1944.....	33	91	35	102	157	20	438
1945.....	37	100	37	106	179	24	483
1946.....	50	126	42	114	266	21	619
1947.....	56	209	65	178	342	31	881
1948.....	67	197	57	212	383	33	949
1949.....	50	161	38	171	440	19	879
1950.....	49	291	57	208	486	20	1,111
1951.....	85	313	59	365	536	38	1,396
1952.....	96	297	56	292	592	30	1,363
1953.....	65	283	56	249	619	20	1,292
1954.....	58	326	64	271	636	20	1,375
1955.....	61	386	79	297	666	28	1,517

^a Excludes books and other printed matter.

CANADIAN WOOD, WOOD PRODUCTS AND PAPER EXPORTED, 1926-55

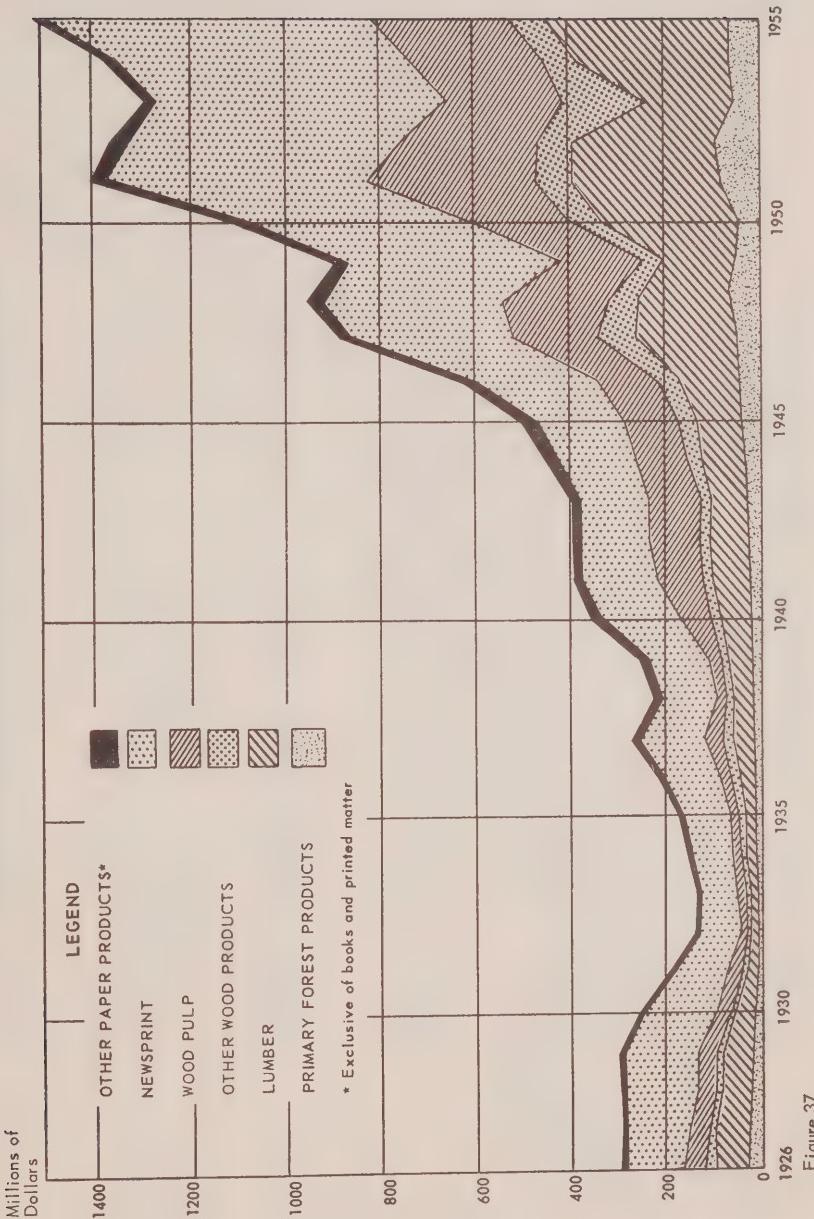


Figure 37

Table 96

CANADIAN WOOD PULP PRODUCTION, 1926-55
(thousands of tons)

Year	Groundwood	Sulphite	Sulphate	All other	Total
1926.....	1,901	995	256	78	3,230
1927.....	1,922	1,016	263	78	3,279
1928.....	2,128	1,117	275	88	3,608
1929.....	2,421	1,236	265	99	4,021
1930.....	2,283	1,077	188	71	3,619
1931.....	2,016	942	145	65	3,168
1932.....	1,696	769	137	61	2,663
1933.....	1,825	910	171	74	2,980
1934.....	2,340	991	206	99	3,636
1935.....	2,504	1,019	237	108	3,868
1936.....	2,910	1,169	273	133	4,485
1937.....	3,309	1,373	313	147	5,142
1938.....	2,462	880	225	101	3,668
1939.....	2,738	1,029	292	107	4,166
1940.....	3,305	1,481	372	133	5,291
1941.....	3,495	1,665	427	134	5,721
1942.....	3,260	1,753	459	134	5,606
1943.....	2,999	1,713	441	120	5,273
1944.....	3,076	1,610	468	117	5,271
1945.....	3,342	1,640	479	140	5,601
1946.....	3,998	1,830	562	225	6,615
1947.....	4,275	2,028	689	262	7,254
1948.....	4,414	2,138	815	308	7,675
1949.....	4,719	1,991	856	287	7,853
1950.....	4,911	2,211	1,054	297	8,473
1951.....	5,172	2,545	1,217	381	9,315
1952.....	5,175	2,378	1,092	323	8,968
1953.....	5,123	2,399	1,206	349	9,077
1954.....	5,338	2,607	1,386	342	9,673
1955.....	5,467	2,817	1,471	396	10,151

CANADIAN WOOD PULP PRODUCTION, 1926-55

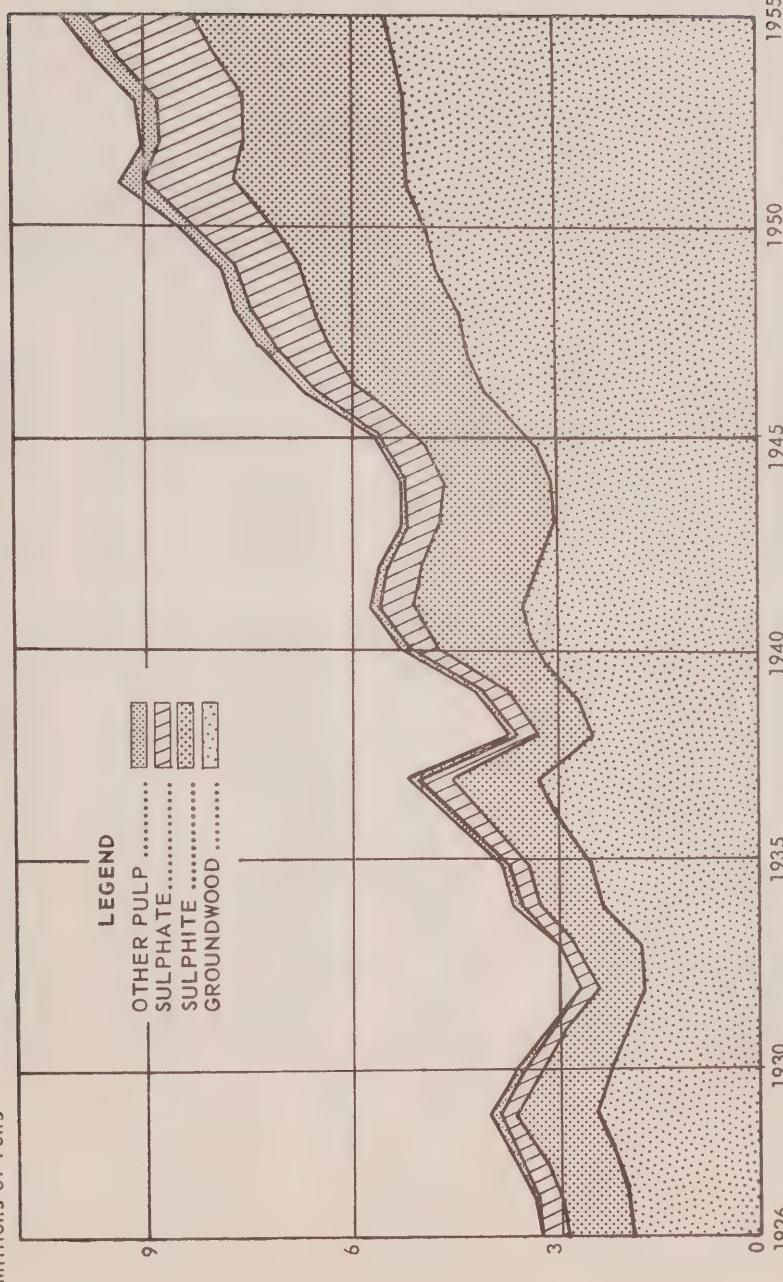


Figure 38

Table 97

UNITED STATES WOOD PULP PRODUCTION, 1926-54
(thousands of tons)

Year	Groundwood	Sulphite	Sulphate	All other	Total
1926.....	1,765	1,558	520	552	4,395
1927.....	1,610	1,553	603	547	4,313
1928.....	1,611	1,559	774	567	4,511
1929.....	1,637	1,689	911	626	4,863
1930.....	1,560	1,567	950	554	4,631
1931.....	1,450	1,417	1,034	508	4,409
1932.....	1,203	1,146	1,029	383	3,761
1933.....	1,197	1,327	1,260	492	4,276
1934.....	1,297	1,446	1,246	447	4,436
1935.....	1,355	1,580	1,468	523	4,926
1936.....	1,476	1,822	1,795	603	5,696
1937.....	1,600	2,140	2,139	693	6,572
1938.....	1,333	1,607	2,443	550	5,933
1939.....	1,445	1,946	2,963	640	6,994
1940.....	1,633	2,607	3,748	971	8,959
1941.....	1,886	2,918	4,526	1,045	10,375
1942.....	1,870	2,931	4,739	1,244	10,784
1943.....	1,767	2,436	4,236	1,241	9,680
1944.....	1,770	2,386	4,549	1,404	10,109
1945.....	1,827	2,359	4,472	1,509	10,167
1946.....	1,951	2,477	4,588	1,591	10,607
1947.....	2,050	2,796	5,357	1,743	11,946
1948.....	2,175	2,811	6,014	1,872	12,872
1949.....	1,960	2,537	5,977	1,733	12,207
1950.....	2,216	2,848	7,501	2,284	14,849
1951.....	2,474	3,141	8,572	2,337	16,524
1952.....	2,321	3,071	8,569	2,512	16,473
1953.....	2,343	3,000	9,444	2,750	17,537
1954.....	2,429	3,174	9,814	2,932	18,349

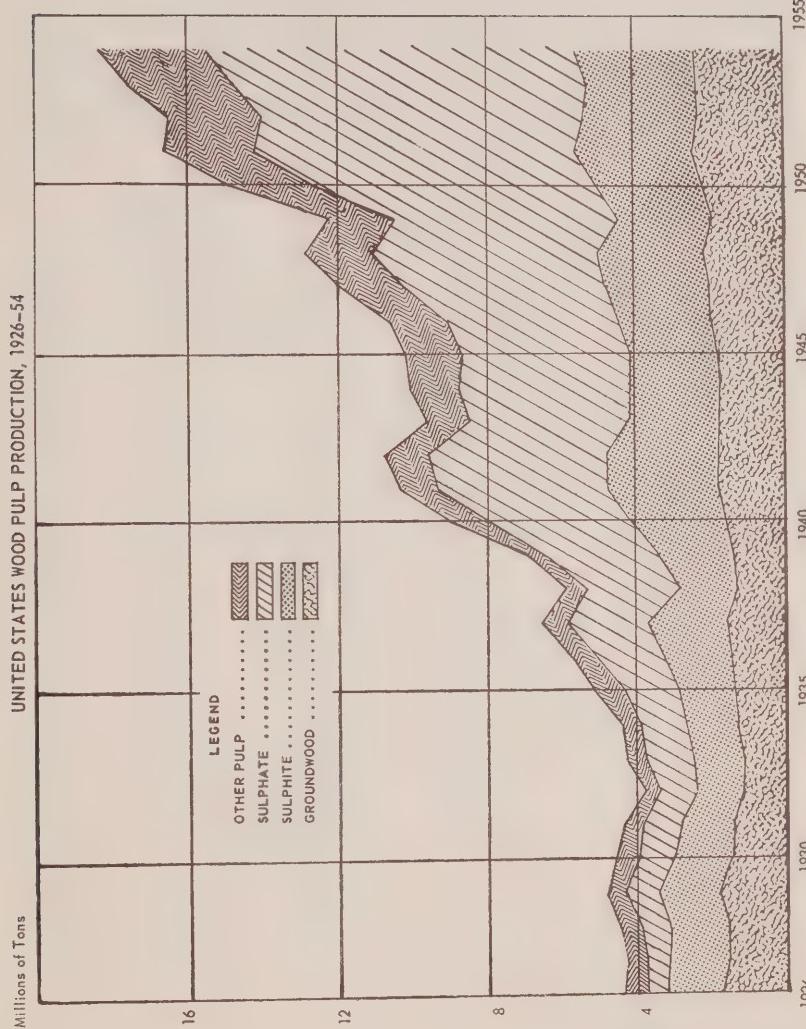


Figure 39

Table 98

CANADIAN WOOD PULP EXPORTED, 1926-55

(thousands of tons)

Year	Sulphite	Sulphate	All other (mainly groundwood)	Total
1926.....	456	168	382	1,006
1927.....	430	170	279	879
1928.....	466	163	235	864
1929.....	451	134	246	831
1930.....	437	86	237	760
1931.....	385	55	183	623
1932.....	288	39	125	452
1933.....	396	59	154	609
1934.....	376	88	142	606
1935.....	412	97	153	662
1936.....	465	119	170	754
1937.....	546	123	202	871
1938.....	335	76	143	554
1939.....	409	109	188	706
1940.....	709	136	224	1,069
1941.....	920	185	307	1,412
1942.....	1,014	181	316	1,511
1943.....	1,056	183	317	1,556
1944.....	960	179	269	1,408
1945.....	943	181	311	1,435
1946.....	907	205	307	1,419
1947.....	1,019	317	363	1,699
1948.....	1,067	390	341	1,798
1949.....	838	470	249	1,557
1950.....	969	582	295	1,846
1951.....	1,162	709	372	2,243
1952.....	1,001	645	295	1,941
1953.....	973	706	271	1,950
1954.....	1,055	845	280	2,180
1955.....	1,159	892	315	2,366

CANADIAN WOOD PULP EXPORTED, 1926-55

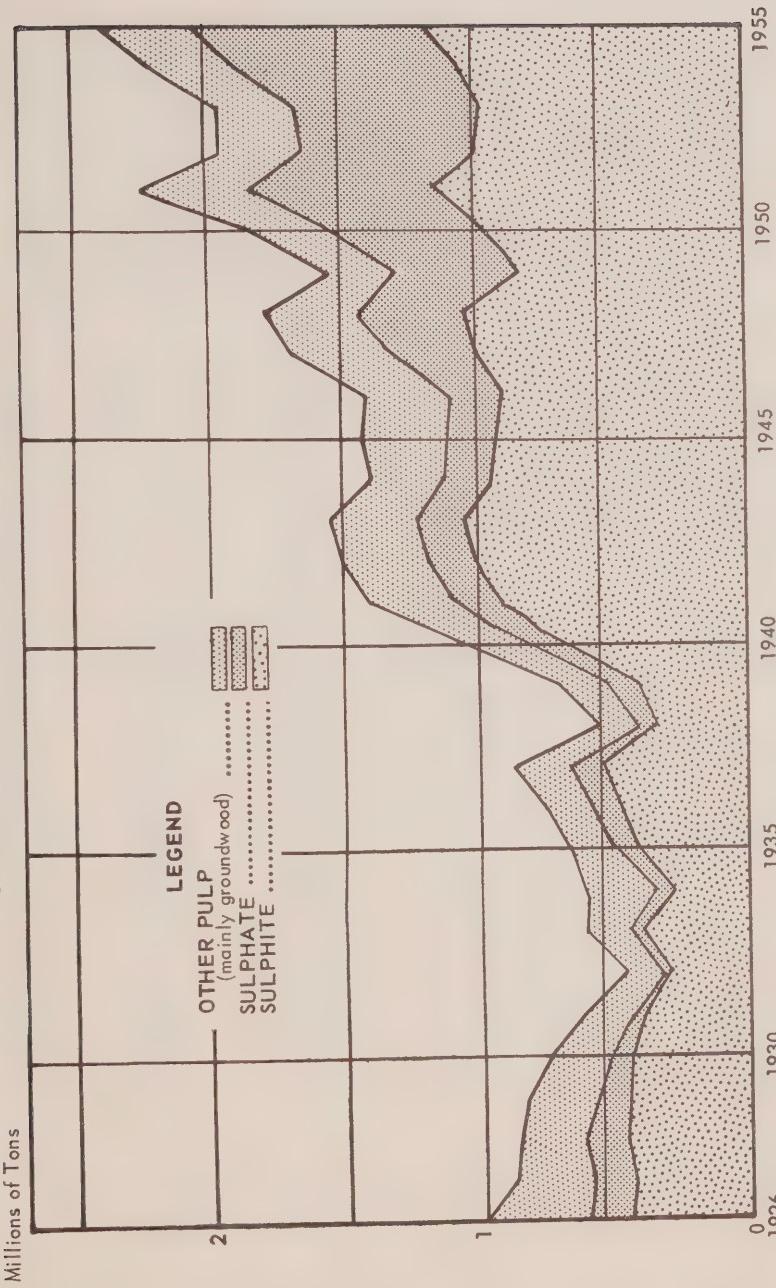


Figure 40

Table 99

CANADIAN PAPER PRODUCTION, 1926-55
(thousands of tons)

Year	Newspaper	Other paper	Total
1926.	1,889	377	2,266
1927.	2,083	386	2,469
1928.	2,414	435	2,849
1929.	2,725	472	3,197
1930.	2,498	429	2,927
1931.	2,227	384	2,611
1932.	1,919	372	2,291
1933.	2,022	397	2,419
1934.	2,605	465	3,070
1935.	2,765	516	3,281
1936.	3,225	582	3,807
1937.	3,674	671	4,345
1938.	2,669	580	3,249
1939.	2,927	674	3,601
1940.	3,504	815	4,319
1941.	3,520	1,005	4,525
1942.	3,257	975	4,232
1943.	3,046	920	3,966
1944.	3,040	1,004	4,044
1945.	3,324	1,036	4,360
1946.	4,162	1,185	5,347
1947.	4,474	1,301	5,775
1948.	4,640	1,424	6,064
1949.	5,187	1,353	6,540
1950.	5,319	1,493	6,812
1951.	5,561	1,664	7,225
1952.	5,707	1,495	7,202
1953.	5,755	1,622	7,377
1954.	6,001	1,649	7,650
1955.	6,196	1,804	8,000

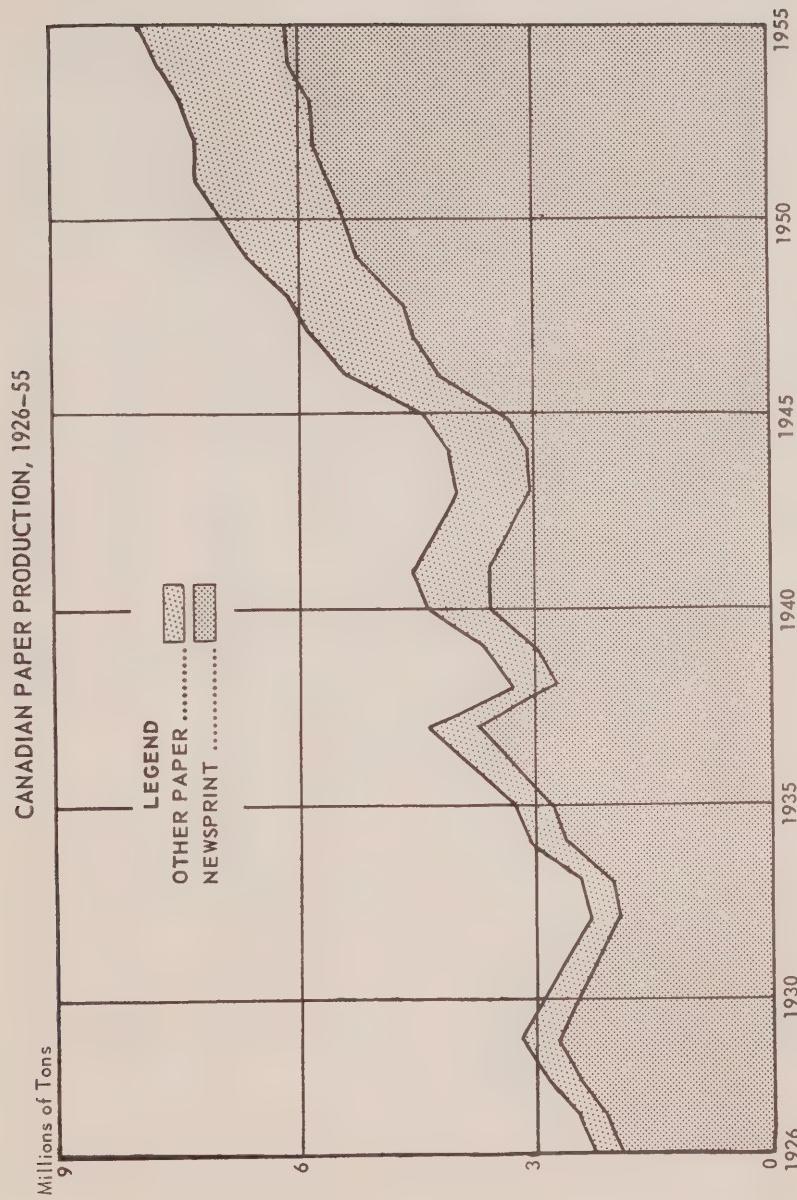


Figure 41

Table 100

CANADIAN PAPER EXPORTED, 1926-55

(thousands of tons)

Year	Newsprint			All other paper	Total
	To United States of America	To United Kingdom	To other countries		
1926.....	1,628	15	89	38	1,770
1927.....	1,748	42	92	43	1,925
1928.....	1,935	131	141	46	2,253
1929.....	2,173	178	164	49	2,564
1930.....	2,008	134	191	40	2,373
1931.....	1,753	104	151	34	2,042
1932.....	1,520	82	175	28	1,805
1933.....	1,520	107	211	33	1,871
1934.....	1,960	84	370	40	2,454
1935.....	2,052	115	407	44	2,618
1936.....	2,399	94	500	68	3,061
1937.....	2,899	148	408	77	3,532
1938.....	1,938	172	315	120	2,545
1939.....	2,206	177	276	137	2,796
1940.....	2,586	145	512	247	3,490
1941.....	2,762	94	406	325	3,587
1942.....	2,792	35	178	237	3,242
1943.....	2,545	30	235	174	2,984
1944.....	2,409	42	355	207	3,013
1945.....	2,534	106	419	227	3,286
1946.....	3,323	83	452	188	4,046
1947.....	3,675	56	490	231	4,452
1948.....	3,917	61	350	260	4,588
1949.....	4,346	108	335	163	4,952
1950.....	4,725	19	194	180	5,118
1951.....	4,775	72	265	247	5,359
1952.....	4,851	131	345	199	5,526
1953.....	4,917	158	300	166	5,541
1954.....	4,867	250	405	153	5,675
1955.....	5,028	286	449	227	5,990

CANADIAN PAPER EXPORTED, 1926-55

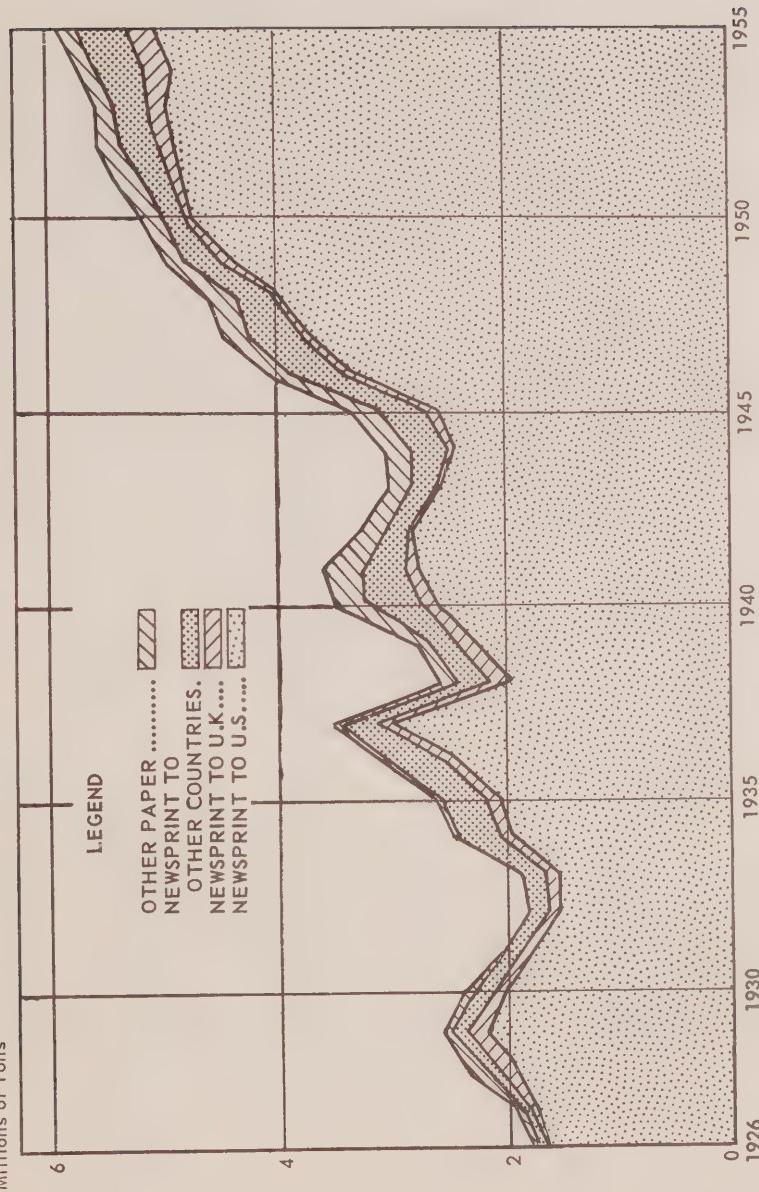


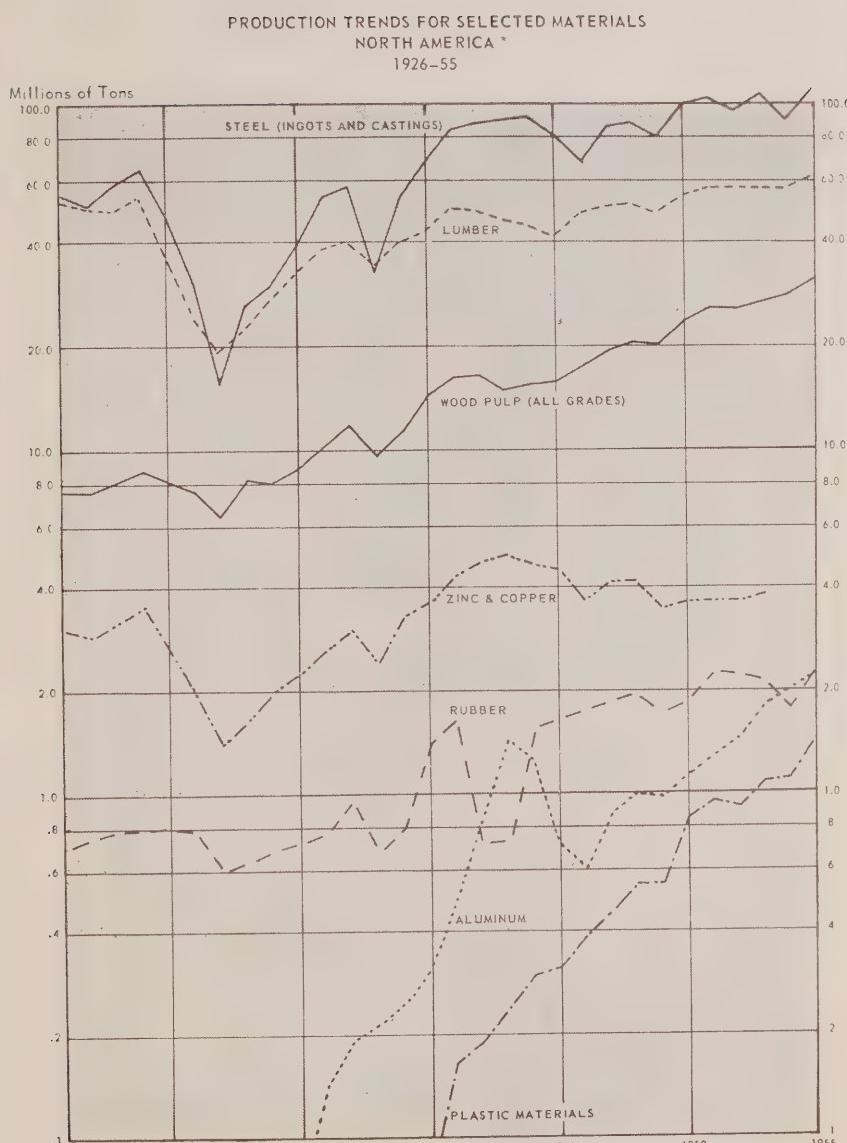
Figure 42

Table 101

**PRODUCTION TRENDS FOR SELECTED MATERIALS,
NORTH AMERICA, 1926-55**

(thousands of tons)

Year	Steel (ingots and castings)	Lumber	Wood pulp (all grades)	Zinc and copper	Rubber	Aluminum	Plastic materials
1926.....	54,958	53,441	7,625	3,042	700	74	
1927.....	51,344	51,328	7,592	2,953	750	82	
1928.....	59,112	49,638	8,119	3,193	780	105	
1929.....	64,748	54,165	8,884	3,523	790	160	
1930.....	46,714	36,186	8,249	2,686	799	153	
1931.....	29,812	25,247	7,577	1,965	780	123	
1932.....	15,703	19,353	6,423	1,410	600	72	
1933.....	26,479	22,545	8,256	1,650	640	61	
1934.....	30,031	27,352	8,072	2,031	690	54	
1935.....	39,239	32,865	8,794	2,269	720	83	
1936.....	54,750	38,436	10,180	2,678	770	142	
1937.....	58,208	40,207	11,715	3,050	950	193	
1938.....	33,046	33,899	9,602	2,427	680	214	
1939.....	54,350	40,170	11,159	3,301	800	246	
1940.....	69,237	43,018	14,251	3,640	1,400	315	99
1941.....	85,551	50,423	16,096	4,378	1,650	523	165
1942.....	89,142	49,416	16,389	4,792	720	862	190
1943.....	91,841	46,673	14,953	4,993	728	1,416	240
1944.....	92,658	45,856	15,379	4,649	1,543	1,238	297
1945.....	82,580	41,868	15,768	4,496	1,655	711	310
1946.....	68,930	48,608	17,222	3,619	1,762	603	380
1947.....	87,840	50,641	19,200	4,134	1,852	871	450
1948.....	91,840	51,681	20,547	4,175	1,950	990	540
1949.....	81,168	48,690	20,060	3,451	1,706	972	540
1950.....	100,220	54,520	23,322	3,637	1,870	1,116	845
1951.....	108,769	57,803	25,839	3,632	2,264	1,284	950
1952.....	96,871	57,551	25,441	3,615	2,215	1,437	911
1953.....	115,726	57,263	26,614	3,823	2,120	1,801	1,084
1954.....	91,507	57,144	28,021	—	1,775	2,019	1,104
1955.....	121,565	61,128	30,981	—	2,299	2,213	1,460



* CANADA AND UNITED STATES ONLY

Figure 43

Appendix B

SUBMISSIONS PERTAINING TO THE FOREST INDUSTRIES

The following is a list of submissions pertaining to forestry and production and trade in forest products received and filed as exhibits by the Commission. In addition to these submissions, the transcript of evidence taken during the course of the Commission's hearings contained much material of use in examining the outlook for the Canadian forest industries.

- Ex. 1—Hon. J. R. Smallwood, Premier, and Mr. H. Carl Goldenberg, Counsel, the Government of the Province of Newfoundland.
- Ex. 4—Hon. H. D. Hicks, Premier, and Hon. W. T. Dauphinee, Minister of Trade and Industry, the Government of the Province of Nova Scotia.
- Ex. 13—Mr. J. K. Bell, Secretary-Treasurer, Maritime Marine Workers' Federation.
- Ex. 18—Hon. Hugh John Flemming, Premier, the Government of the Province of New Brunswick.
- Ex. 20—Mr. Nelson Mann, Executive Manager, the Atlantic Provinces Economic Council.
- Ex. 24—Hon. D. L. Campbell, Premier; Hon. R. D. Turner, Minister of Industry and Commerce; Hon. R. D. Robertson, Minister of Agriculture; the Government of the Province of Manitoba.
- Ex. 35—Hon. T. C. Douglas, Premier; Hon. I. C. Nollett, Minister of Agriculture; Hon. J. H. Brockelbank, Minister of Natural and Mineral Resources; Hon. C. M. Fines, Provincial Treasurer; the Government of the Province of Saskatchewan.
- Ex. 47—Hon. E. C. Manning, Premier, and Hon. A. R. Patrick, Minister of Economic Affairs, Government of the Province of Alberta.
- Ex. 49—Mr. M. W. Mackenzie, President, Canadian Chemical & Cellulose Company, Ltd.
- Ex. 50—Mr. R. G. Robertson, Commissioner of the Northwest Territories.
- Ex. 52—Mr. F. H. Collins, Commissioner of the Yukon Territory.
- Ex. 54—Mr. Harold Hine, Counsel and Director, the Board of Trade of the City of Whitehorse, Yukon Territory.
- Ex. 73—Hon. W. A. C. Bennett, Premier, and Hon. R. W. Bonner, Attorney General, Government of the Province of British Columbia.
- Ex. 73A—Government of the Province of British Columbia (documentary submission).
- Ex. 75—Mayor Geo. Muir, Nanaimo, and Mr. D. M. Greer, Nanaimo Chamber of Commerce, the Corporation of the City of Nanaimo and the Nanaimo Chamber of Commerce.
- Ex. 80—Mr. R. A. Mahoney, Management Research (Western) Ltd., Consultant for Forest Industry Associations of British Columbia, comprising the following: British Columbia Loggers Association; British Columbia Lumber Manufacturers Association; Canadian Pulp & Paper Association (Western Division); Consolidated Red Cedar Shingle Association; Interior Lumber Manufacturers Association; Northern Interior Lumbermen's Association; Plywood Manufacturers Association of British Columbia; the Truck Loggers Association.

- Ex. 97—Mr. Homer J. Stevens, General Secretary-Treasurer, United Fishermen and Allied Workers Union.
- Ex. 111—Mr. R. M. Fowler, President, Canadian Pulp and Paper Association.
- Ex. 112—Mr. E. Howard Smith, President, Howard Smith Paper Mills Limited.
- Ex. 121—Mr. Vernon E. Johnson, President, Canadian International Paper Company.
- Ex. 127—Mr. D. W. Ambridge, President and General Manager, Abitibi Power & Paper Company Limited.
- Ex. 139—Hon. Leslie M. Frost, Prime Minister, Government of the Province of Ontario.
- Ex. 179—Hon. C. E. Mapledoram, Minister of Lands and Forests, Ontario, and Mr. G. C. Wardrobe, M.L.A., on behalf of the Northwestern Ontario Associated Chambers of Commerce, the Northwestern Ontario Municipal Association, and the Northwestern Ontario Development Association.
- Ex. 199—Mr. G. Harold Fiske, President, the Canadian Forestry Association.
- Ex. 199A—Mr. J. L. Van Camp, General Manager, Canadian Forestry Association (supplementary submission).
- Ex. 201—Mr. W. N. Hall, Executive Vice-President, Dominion Tar & Chemical Company, Limited.
- Ex. 220—Mr. Roy Halliday, President, the Canadian Lumbermen's Association.
- Ex. 221—Mr. J. W. B. Sisam, President, the Canadian Institute of Forestry.
- Ex. 222—Mr. Walter C. Koerner, President, Alaska Pine & Cellulose Limited.
- Ex. 223—Mr. R. L. Weldon, President, Bathurst Power & Paper Company Limited.
- Ex. 239—Mr. Leslie Morris, Organizational Secretary, Labour-Progressive Party.
- Ex. 247—Mr. Stewart Bates, President, Central Mortgage & Housing Corporation.
- Ex. 254—Mr. A. Turner Bone, President, the Canadian Construction Association.
- Ex. 264—Mr. T. B. Fraser, the Chamber of Commerce of the District of Baie Comeau, supported by the Eastern and Western Chambers of "the North Shore", Saguenay County, Que., and also by the Chamber of Commerce of the South Shore.
- Ex. 265—Prof. Albert Faucher, the Committee on Industrial Development for the Federation of Abitibi Chambers of Commerce.
- Ex. 272—Mr. Arthur Edgecombe, Chairman, Newfoundland Branch, Canadian Manufacturers' Association, Inc.
- Ex. 273—Mr. Arthur Johnson, Vice-President for Newfoundland of the Atlantic Provinces Economic Council.
- Ex. 275—Mr. Leander Manley, Secretary Manager, Canadian Pulp and Paper Association (Western Division).
- Ex. 281—Mr. R. T. Rose, General Manager, the Vancouver Board of Trade.
- Ex. 291—Mr. Jules Breton, Manager, L'Association Forestière Québécoise, Inc.
- Ex. 292—Mr. L. Z. Rousseau, La Faculté d'Arpentage et de Génie Forestier et Le Fonds de Recherches Forestières de l'Université Laval.

Appendix C

OTHER STUDIES TO BE PUBLISHED BY THE ROYAL COMMISSION

Output, Labour and Capital in the Canadian Economy—
by Wm. C. Hood and Anthony Scott

Canadian Energy Prospects—
by John Davis

Progress and Prospects of Canadian Agriculture—
by W. M. Drummond and W. Mackenzie

The Commercial Fisheries of Canada—
by The Fisheries Research Board and The Economic
Service of The Department of Fisheries of Canada

Mining and Mineral Processing in Canada—
by John Davis

Canadian Secondary Manufacturing Industry—
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